Stormwater Management Action Plan (SMAP) for the Olson Creek Catchment Area – Auburn, Washington

Prepared for

CITY OF AUBURN WASHINGTON

March 2023

Prepared by

Parametrix

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CITATION

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Prepared by Parametrix, Seattle, Washington.
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ACRONYMS AND ABBREVIATIONS

B-IBI	Benthic-Index of Biotic Integrity
BMP	Best Management Practice
CIP	Capital Improvement Project
City	City of Auburn
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
IDDE	Illicit Discharge Detection and Elimination
MODA	Multi-Objective Decision Analysis
NPDES	National Pollutant Discharge Elimination System
Permit	Ecology NPDES Western Washington Phase II Municipal Stormwater Permit
SMA	Stormwater Management Action
SMAP	Stormwater Management Action Plan

1. INTRODUCTION

1.1 Purpose

This report documents the City of Auburn's (City's) Stormwater Management Action Plan (SMAP) for the Olson Creek Catchment Area, which has been selected by the City as the high-priority basin for selected stormwater actions. For this SMAP development process, the City has followed the elements outlined in the Washington State Department of Ecology (Ecology) National Pollutant Discharge Elimination System (NPDES) Western Washington Phase II Municipal Stormwater Permit (Permit) Section S5.C.1 – Stormwater Planning (Ecology 2019a).

The goal of the Olson Creek SMAP is to address impacts from existing or planned development on priority receiving waters. The SMAP includes the following elements:

- Receiving Water Assessment in accordance with NPDES Phase II Permit Section S5.C.1.d.i.
- Receiving Water Prioritization in accordance with NPDES Phase II Permit Section S5.C.1.d.ii.
- Stormwater Management Action Plan (SMAP) in accordance with NPDES Phase II Permit Section S5.C.1.d.iii.

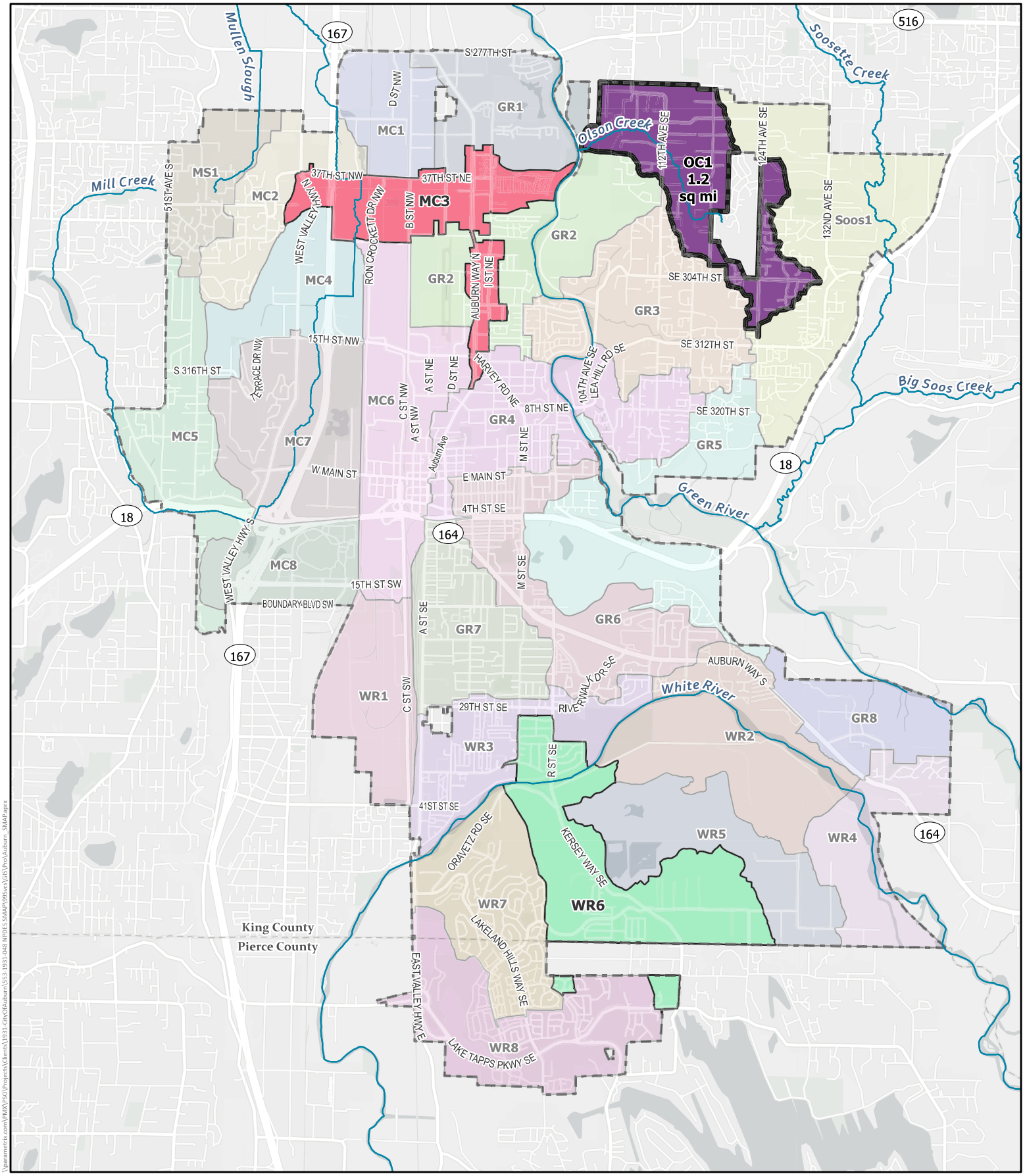
The Receiving Water Assessment has been completed, and the results are documented in the Receiving Water Assessment (Parametrix 2022a; see Appendix A). The Receiving Water Prioritization has been completed and the results documented in the Receiving Water Prioritization Technical Memorandum (Parametrix 2022b; see Appendix B).

1.2 Selection of Priority Catchment Area

The Receiving Water Prioritization Technical Memorandum identified three high-priority catchment areas for the SMAP: Mill Creek 3, White River 6, and Olson Creek 1. The candidate priority catchment areas were advertised for public comment and evaluated by the City's SMAP Interdisciplinary Team. Through review of all of the input, the City selected Olson Creek as the final SMAP high-priority catchment area (Figure 1). Key considerations regarding selection of the Olson Creek catchment area are as follows:

- The Olson Creek catchment area was shown to be more susceptible to degradation from future development during the FutureShed analysis described in the Receiving Water Prioritization Technical Memorandum.
- The Olson Creek catchment contains less than 30% impervious area throughout the basin and contains a benthic-index of biotic integrity (B-IBI) point at the outlet of the basin. In a summary from the Environmental Protection Agency (EPA), the physical, chemical, and biological parameters of urban streams decline with increased impervious cover. Several thresholds of stream health are reported between 1% and 40% impervious area. As such, decreasing the impervious area in a basin with a lower impervious area coverage (such as 30% to 20%) will have a greater impact on the B-IBI score than decreasing the impervious area in a basin with a higher amount of impervious area (such as 80% to 70% impervious area).

The Olson Creek catchment area surrounds a section of the City of Kent that is under consideration for annexation. However, the section belonging to the City of Kent is fully treated and will not require immediate considerations for stormwater improvements.



Date: 3/28/2023
Sources: City of Auburn, King County, Pierce County, WA Ecology, WA DNR, USGS, ESRI
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Auburn City Limits
Major Stream

Selected Priority Catchment
Olson Creek 1

Other Identified Priority Catchments
White River 6
Mill Creek 3

0 2,000 4,000 Feet

Figure 1
Selected High-Priority Catchment Area
Stormwater Management Action Plan (SMAP) for Olson Creek 1

Auburn, WA

2. STORMWATER MANAGEMENT ACTIONS OVERVIEW

The City's planned stormwater management actions (SMAs) for Olson Creek are summarized below in Table 1 and described in detail in the sections that follow.

Table 1. Proposed Stormwater Management Actions

	Proposed SMA	Budget	Implementation Schedule	Future Assessment Frequency
Stormwater Facility Retrofits				
Short-Term	CIP 1 - SE 287th St Road Retrofit	$382,000	2024	Every year
Short-Term	CIP 2 - SE 284th St and 109th Ave SE Road Retrofit	$143,000	2027	Every year
Short-Term	CIP 3 - SE 284th St West Road Retrofit	$52,000	2029	Every year
Long-Term	CIP 4 - SE 284th St East Road Retrofit	$28,000	2031	Every year
Long-Term	CIP 5 - 124th Ave SE near SE 293rd St Road Retrofit	$581,000	2033	Every year
Long-Term	CIP 6 - Vintage Hills Existing Facility Retrofit	$264,000	2036	Every year
Long-Term	CIP 7 - 124th Ave SE near SE 302nd Pl Road Retrofit	$531,000	2038	Every year
Long-Term	CIP 8 - 124th Ave SE near SE 307th Pl Road Retrofit	$531,000	2041	Every year
Land Management/Development Strategies				
Short-Term	Review mechanisms to transfer development density from higher-value areas of the catchment to other parts of the basin	TBD	2025	One time in short-term cycle
Short-Term	Review stream buffer requirements for Olson Creek and consider updating protections	TBD	2026	One time in short-term cycle
Short-Term	Initiate a floodplain study on Olson Creek and provide protection measures based on the study	TBD	2029	One time in short-term cycle
Long-Term	Identify high-value stream segments and stream elements (floodplains, buffer, riparian wetlands, basin wetlands) for restoration projects	TBD	2031	One time in long-term cycle
Tailored Stormwater Management Program				
Short-Term	Source Control – A source control program was started in 2023. Will continue to review the program as inspections and actions are identified and potentially broaden inspection inventory	TBD	2025	Every 2 years
Short-Term	Operations and Maintenance – Review and consider expansion of the street sweeping program	TBD	2027	Every 5 years
Long-Term	Enhanced Maintenance – Develop improvements to the ditch maintenance program to improve water quality treatment and/or increase conveyance capacity in roadside ditches	TBD	2031	One time in long-term cycle

The column titled Implementation Schedule describes whether the project is planned to be implemented in the short term (0 to 6 years) or the long term (7 to 20 years).

The column titled Future Assessment Frequency is included in response to Permit Section S5.C.1.d.iii.(f), which requires the SMAP to include the following:

> *A process and schedule to provide future assessment and feedback to improve the planning process and implementation of procedures or projects.*

All descriptions and details of the SMAs in this report are at the preliminary assessment level and will be updated as the SMA development progresses.

3. STORMWATER FACILITY RETROFITS

3.1 Requirement

Permit Section S5.C.1.d.iii.(a) requires the SMAP to include projects that improve stormwater quality through retrofitting developed areas that do not have stormwater management and retrofitting existing treatment facilities or areas with upgrades to current stormwater control practices. The City would, in assessing proposed site or facility retrofitting, establish the feasibility and the available potential benefits for each candidate retrofit. The projects would then be prioritized as short- and long-term actions.

3.2 Screening Methodology

The City has selected stormwater facility retrofit projects for the Olson Creek SMAP based on the process described below.

Step 1. Stormwater Management Coverage Assessment

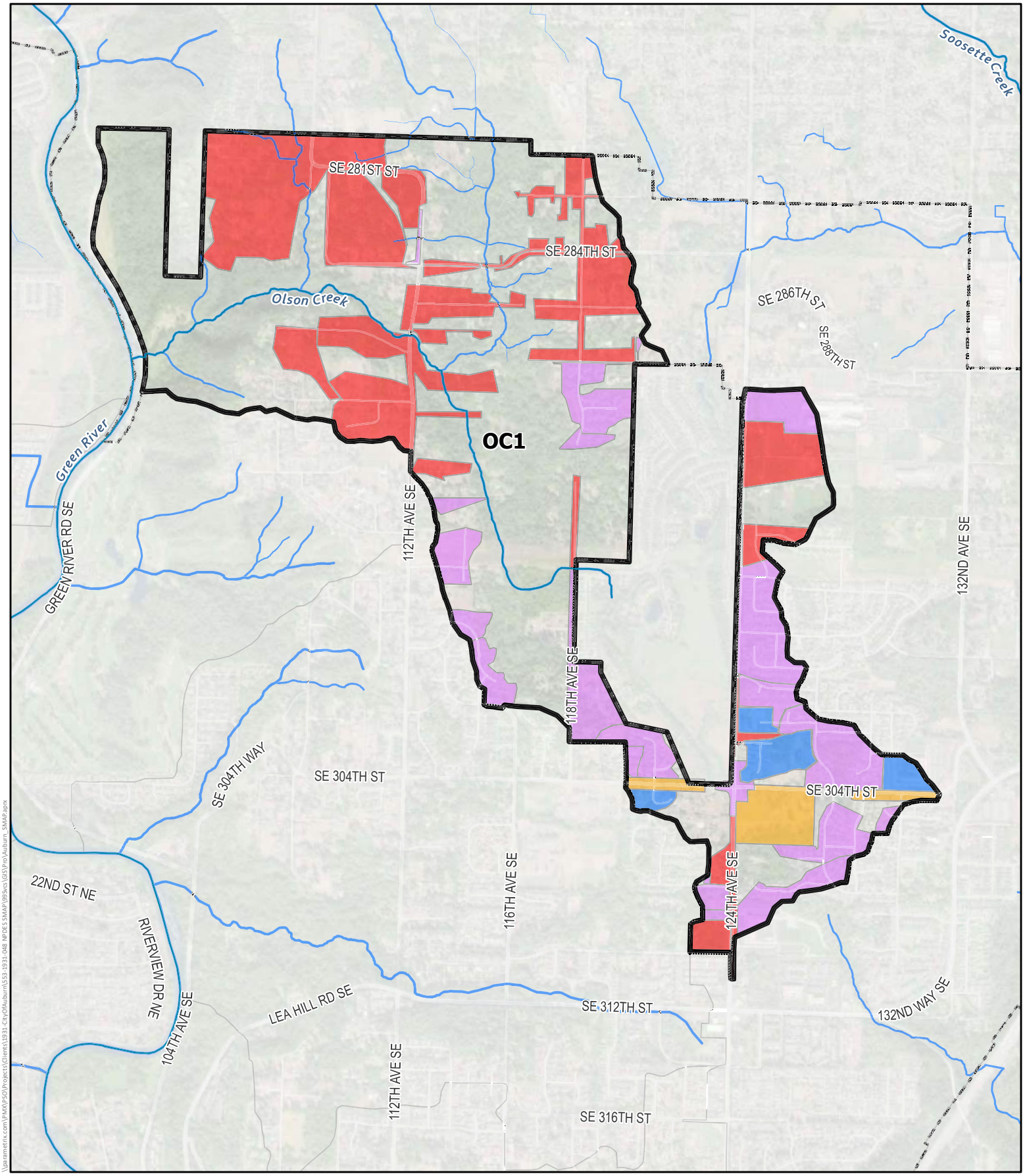
The City's existing stormwater management "treatment coverage" was mapped throughout the Olson Creek Basin (Figure 2). The treatment coverage was identified using best available information, such as stormwater facilities, stormwater facility age, parcel age, drainage systems, and topography. The treatment coverage was divided into three categories: *no management* (no identified treatment in the area), *vintage* (all identified treatment was built before 2012), and *current standards* (all identified treatment was built after 2012 and, therefore, was designed to forested predeveloped conditions, as described in the Ecology Stormwater Management Manual for Western Washington; Ecology 2019b). More information about the treatment coverage categories can be found in Appendix B. These treatment coverage areas were then evaluated for retrofit opportunities based on the following criteria:

- Developed areas with no stormwater management.
- Developed areas with existing vintage stormwater management.
- Arterial roadways not generally affiliated with development projects with available right-of-way.
- Large, single-purpose development, such as schools.
- Areas receiving significant urban stormwater runoff where treatment could be consolidated.

Lands generally excluded from consideration for retrofitting were categorized as not needing controls or low priority. These were categorized and not further assessed, and they include those lands not usually responsible for urban stormwater runoff, including the following:

- Redevelopable lands – Underdeveloped parcels that will have current stormwater management when redeveloped or rural low-development-density lands that do not require stormwater management (Figure 2).
- Future Planned lands – Planned development that will provide current stormwater management (Figure 2).
- Critical areas, stream buffer, wetlands, and floodplains (although no floodplains are mapped the Olson Creek catchment).
- Intact upland forest.

This stormwater management coverage assessment provides a method to continue retrofitting the Olson Creek Basin after the SMAP process until all treatment coverage gaps within the basin are addressed and either meet current standards or do not need stormwater controls. From this assessment, 30 sites were identified for potential retrofitting.



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Olson Creek 1
Auburn City Limits

Treatment Areas
Current Treatment
Vintage Treatment
Future Planned
Treatment Gap

0 1,000 2,000 Feet

Figure 2
Treatment Area Coverage Stormwater Management Action Plan (SMAP) for Olson Creek 1

Auburn, WA

Step 2. Candidate Project Screening

A high-level feasibility screening was conducted on the 30 potential retrofit sites by members of the City's Interdisciplinary Team in order to narrow down potential project opportunities. The screening criteria was based on the following site attributes: ability to be executed with minimal delay (e.g., the land or facility is owned by the City), known obstacles to implementing the project at this time, and low potential benefits or small catchments with low impacts (generally less than 1 to 2 impervious acres). Through this screening, 11 preferred sites (listed in Appendix C) were selected to move on to a multi-objective decision analysis (MODA), detailed in Step 3.

Step 3. MODA, Cost Benefit Analysis, and Roadway Treatment Analysis

A multi-objective decision analysis (MODA) is a process used to help make decisions on complex issues involving multiple criteria and multiple invested parties. Through the MODA process, the City was able to consider and weigh certain factors while evaluating each alternative to help decide on a recommendation.

The first step of the MODA process was to determine and weight project criteria. Then each alternative was rated based on these criteria. Next, the rating factors for each alternative were multiplied with the weights of each criterion to determine the points earned by each project in each category. These points were then summed to produce the Total Weighted Criteria Points for each project. The Total Weighted Criteria Points helped inform which projects best meet plan objectives and could provide the overall highest benefit based on the criteria.

Following these MODA steps, the projects were ranked using a preliminary cost benefit analysis. To examine the benefits of each project even further, the City also compared the amount of treated roadway each project would provide. The complete results of the MODA, cost benefit, and treated roadway analyses can be found in Appendix C. Based on these analyses, the City is moving forward with 8 of the highest ranking 11 projects across all categories. These eight projects and their locations are listed in Table 2 below and detailed in Table 4, Table 5, and Appendix D. Opportunities for earlier implementation of any of the projects listed will be evaluated during the City's capital planning process.

Table 2. Projects Chosen for Implementation

CIP Identifier	Project	Retrofit Type	Description
CIP 1	SE 287th St	Road Retrofit	Adding a manufactured treatment device to the end of SE 287th to provide enhanced water quality treatment for 7.3 acres
CIP 2	SE 284th St and 109th Ave SE	Road Retrofit	Adding two bioretention swales to the corner of SE 284th St and 109th Ave SE to provide basic water quality treatment for 20.6 acres
CIP 3	SE 284th St West	Road Retrofit	Adding two bioretention swales to SE 284th near 112th Ave SE—one on the north side of the road and one on the south side of the road—to provide basic water quality treatment for 2.2 acres
CIP 4	SE 284th St East	Road Retrofit	Adding one bioretention swale to the south side of SE 284th St near 118th Ave SE to provide basic water quality treatment for 1.8 acres
CIP 5	124th Ave SE near SE 293rd St	Road Retrofit	Adding manufactured treatment devices to 124th Ave SE to provide enhanced water quality treatment for 14.1 acres
CIP 6	Vintage Hills	Existing Facility Retrofit	Retrofitting the existing Vintage Hills swale (located on 124th Ave SE just north of SE 296th Way) to a bioretention best management practice to provide enhanced water quality treatment for 5.0 acres
CIP 7	124th Ave SE near SE 302nd Pl	Road Retrofit	Adding manufactured treatment devices to 124th Ave SE to provide enhanced water quality treatment for 2.9 acres
CIP 8	124th Ave SE near SE 307th Pl	Road Retrofit	Adding manufactured treatment devices to 124th Ave SE to provide enhanced water quality treatment for 5.9 acres

3.3 Selected Project Prioritization and Implementation

3.3.1 Project Descriptions

For those projects that remain after the MODA (Appendix C), capital project descriptions were developed to include background information, treatment area, preliminary design, best management practice (BMP) type, and planning-level cost (Appendix D).

3.3.2 Planning Horizon Selection and Prioritization

The pacing of project implementation is based on available staff resources, funding levels, and total cost of the program over the short-term (6-year) and long-term (20-year) planning horizons. The estimated capacity for delivery is based on available funding and project timeline.

The project timeline is a high-level estimate that was approximated using professional judgment and similar project timelines. These estimates were only used to help approximate the likely capacity to deliver projects in the SMAP timeframe (20 years). Based on the estimated timeline for the staff resources to plan, design, and construct a project (see Table 3), it is feasible to complete a project every 2 to 3 years. This means three projects in the short term (0 to 6 years) and five projects in the long term (7 to 20 years) could be implemented.

Table 3. Estimated Project Timelines

Project	Estimated Project Timeline (Months)					
	Project Evaluation	Preliminary Design	Final Design	Permitting	Construction	Total Years
CIP 1 – SE 287th St	0.25	0.25	1	0.75	0.5	3
CIP 2 – SE 284th St and 109th Ave SE	0.25	0.25	0.75	0.5	0.25	2
CIP 3 – SE 284th West	0.25	0.25	0.75	0.5	0.25	2
CIP 4 – SE 284th East	0.25	0.25	0.75	0.5	0.25	2
CIP 5 – SE 124th St near SE 293rd St	0.25	0.25	1	0.75	0.5	3
CIP 6 – Vintage Hills	0.25	0.25	0.75	0.5	0.25	2
CIP 7 – 124th Ave SE near SE 302nd Pl	0.25	0.25	1	0.75	0.5	3
CIP 8 – 124th Ave SE near SE 307th Pl	0.25	0.25	1	0.75	0.5	3

Three projects were prioritized for the first 6 years based on their MODA score, cost, and location. The capital and construction costs to deliver the three prioritized projects in the short term is $577,000 (see Opinions of Probable Cost in Appendix D). The capital and construction costs to deliver the five prioritized projects in the long term is $1,935,000 in 2023 dollars (see Opinions of Probable Cost in Appendix D). This will require approximately $96,200 (in 2023 dollars) of capital budget on average each year in the first 6 years and $138,200 (in 2023 dollars) of budget per year in the last 14 years. The City will review the list of stormwater facility retrofits each year of its capital programming update process and make revisions based on available funding and staff resources.

3.3.3 Short-Term (Years 1 to 6) Implementation Plan

Stormwater retrofits planned for the short-term horizon from 2024 to 2030 (0 to 6 years) and their tributary areas are summarized below in Table 4, shown in the map in Figure 3, and detailed in Appendix D.

Table 4. Short-Term Stormwater Facility Retrofits

Project Name	Description of BMP[1]	Tributary Area[2] (acres)	Cost & Potential Funding	Schedule	Future Assessment Considerations
Future Assessment note: All listed stormwater facility retrofits are contingent on site feasibility confirmation, permitting constraints, and staff and funding resources.					
CIP 1 – SE 287th St	Road Retrofit – enhanced water quality	7.3	$382,000	2024	Every year
CIP 2 – SE 284th St and 109th Ave SE	Road Retrofit – basic water quality	20.6	$143,000	2027	Every year
CIP 3 – SE 284th West	Road Retrofit – basic water quality	2.2	$52,000	2029	Every year

1. BMP = best management practice
2. The objective of the facility retrofits is to treat as much of the tributary area as possible; however, the final treatment area will be determined through advanced project design based on available facility footprint.

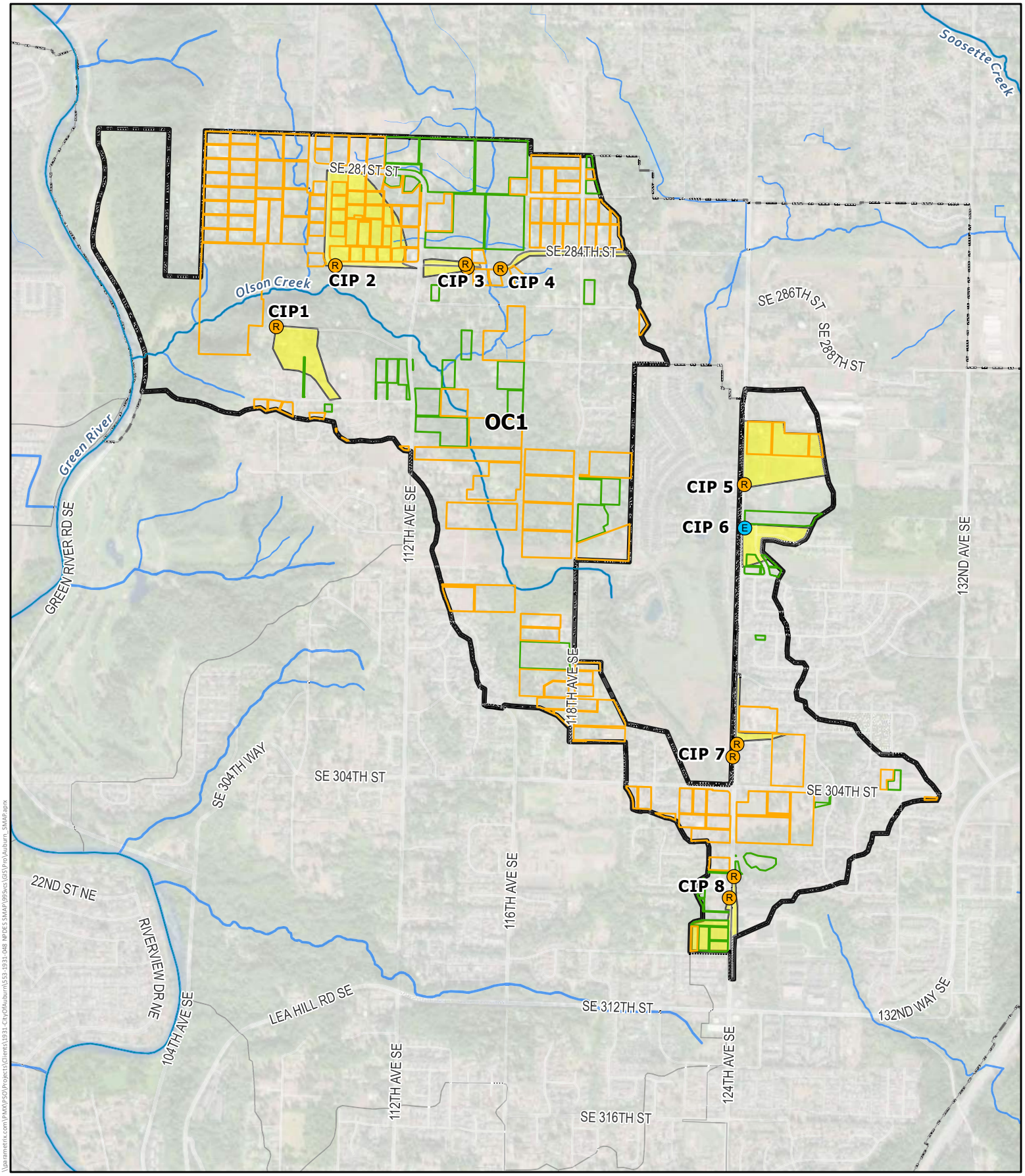
3.3.4 Long-Term (Years 7 to 20) Implementation Plan

Stormwater facility retrofits planned for the long-term horizon from 2031 to 2044 (7 to 20 years) and their tributary areas are summarized below in Table 5, shown in the map in Figure 3, and detailed in Appendix D.

Table 5. Long-Term Stormwater Facility Retrofits

Project Name	Description of BMP[1]	Tributary Area[2] (acres)	Cost & Potential Funding	Schedule	Future Assessment Considerations
Future Assessment note: All listed stormwater facility retrofits are contingent on site feasibility confirmation, permitting constraints, and staff and funding resources.					
CIP 4 – SE 284th East	Road Retrofit – basic water quality	1.8	$28,000	2031	Every year
CIP 5 – 124th Ave SE near SE 293rd St	Road Retrofit – enhanced water quality	14.1	$581,000	2033	Every year
CIP 6 – Vintage Hills	Existing Facility Retrofit – enhanced water quality	5.0	$264,000	2036	Every year
CIP 7 – 124th Ave SE near SE 302nd Pl	Road Retrofit – enhanced water quality	2.9	$531,000	2038	Every year
CIP 8 – 124th Ave SE near SE 307th Pl	Road Retrofit – enhanced water quality	5.9	$531,000	2041	Every year

1. BMP = best management practice
2. The objective of the facility retrofits is to treat as much of the tributary area as possible; however, the final treatment area will be determined through advanced project design based on available facility footprint.



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Olson Creek 1
Auburn City Limits

Proposed Projects
- Existing Facility Retrofit
- Road Retrofit
- Proposed Project Treatment Areas

Buildable Lands
- Vacant
- Redevelopable

0 1,000 2,000 Feet

Figure 3
Proposed Stormwater Facility Locations
Stormwater Management Action Plan (SMAP) for Olson Creek 1

Auburn, WA

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4. LAND MANAGEMENT AND DEVELOPMENT STRATEGIES

4.1 Requirement

Permit Section S5.C.1.d.iii.(b) requires the SMAP to include the following:

> *Land management/development strategies and/or actions identified for water quality management.*

One approach to receiving water protection is minimizing stormwater impacts before they can occur by redirecting or locating development and land conversion (e.g., impervious surface conversions or native vegetation removal) through land use policies. Strategies and policies for this approach can be a component of the action plan, which is especially important in the Olson Creek catchment area because it is not a fully developed watershed and contains a relatively small stream with good water quality.

4.2 Screening Methodology

Members of the City's Interdisciplinary Team reviewed potential land management and development strategies and considered actions that could most readily and reasonably be implemented to benefit the Olson Creek catchment area. Elements reviewed by the City included the following:

1. **Growth management:** Coordinating between City departments to update comprehensive plans across the City in ways that include long-range stormwater management and pollution-reducing strategies.
2. **Developer incentives:** Instituting incentives for developers to encourage designs that minimize impacts to natural waters.
3. **Code updates:** Reviewing the existing City ordinances and codes for potential updates to development requirements that help prevent pollution-generation.
4. **City policies:** Updating City policies for land development to promote better stormwater management practice.

4.3 Identified Actions

4.3.1 Short-Term Actions

Land and development management actions planned for the short-term horizon from 2024 to 2030 (0 to 6 years) are summarized below in Table 6. All proposed actions are included in the implementation plan. The cost and resources for the actions will be estimated closer to when the action is implemented.

Table 6. Short-Term Land Management Actions

Action	Schedule	Future Assessment Considerations
Review mechanisms to transfer development density from higher value areas of the catchment to other parts of the basin	2025	One time in short-term cycle
Review stream buffer requirements for Olson Creek, and consider updating protections	2026	One time in short-term cycle
Initiate a floodplain study on Olson Creek, and provide protection measures based on the study	2029	One time in short-term cycle

4.3.2 Long-Term Actions

Land and development management actions planned for the long-term horizon from 2030 to 2043 (7 to 20 years) are summarized below in Table 7.

Table 7. Long-Term Land Management Actions

Action	Schedule	Future Assessment Considerations
Identify high-value stream segments and stream elements (floodplains, buffer, riparian wetlands, basin wetlands) for restoration projects	2031	One time in long-term cycle

5. TAILORED STORMWATER MANAGEMENT PROGRAM

5.1 Requirement

Permit Section S5.C.1.d.iii.(c) requirements for the SMAP are as follows.

> *Targeted, enhanced, or customized implementation of stormwater management actions related to permit sections within S5, including:*
>
> - *IDDE field screening,*
> - *Prioritization of Source Control inspections,*
> - *O&M inspections or enhanced maintenance, or*
> - *Public Education and Outreach behavior change programs.*
>
> *Identified actions shall support other specifically identified stormwater management strategies and actions for the basin overall, or for the catchment area in particular.*

5.2 Screening Methodology

The City's Utility staff reviewed the existing stormwater management program components and selected elements that could be enhanced to benefit the Olson Creek catchment area. Elements reviewed by the City included those listed in Permit Section S5.C.1.d.iii.(c). There will be a limited direct cost to implement these programs; however, there will be resource needs for City staff.

5.3 Selection Actions

5.3.1 Short-Term Actions

Tailored stormwater management program actions planned for the short-term horizon from 2024 to 2030 (0 to 6 years) are summarized below in Table 8.

Table 8. Short-Term Tailored Stormwater Management Program Actions

Permit Category	Action	Schedule	Future Assessment Considerations
Source Control	A source control program was started in 2023. Businesses operating within the basin will be evaluated for prioritized inspection and outreach.	2025	Every 2 years
Operations and Maintenance	Review and consider expansion of the street sweeping program	2027	Every 5 years

5.3.2 Long-Term Actions

Tailored stormwater management program actions planned for the long-term horizon from 2031 to 2044 (7 to 20 years) are summarized below in Table 9.

Table 9. Long-Term Tailored Stormwater Management Program Actions

Permit Category	Action	Schedule	Future Assessment Considerations
Enhanced Maintenance	Develop a ditch maintenance program to improve water quality treatment and/or increase conveyance capacity in roadside ditches	2031	Every 5 years

6. LONG-RANGE PLANS

6.1 Requirement

Permit Section S5.C.1.d.iii.(e) requires the SMAP to include the following:

> *Identification of changes needed to local long-range plans, to address SMAP priorities.*

6.2 Identified Long-Range Plan Coordination

The City has identified the following long-range plans and those needed for coordination throughout the implementation of the Olson Creek SMAP:

- City of Auburn Comprehensive Plan – Incorporate the SMAP into the next update of the Comprehensive Plan by reference.
- Parks, Arts, and Recreation – Evaluate stormwater management options related to parks and recreation for inclusion in the next update of the Parks and Recreation Open Space Plan.
- Comprehensive Storm Drainage Plan – Includes additional capital projects, program resource needs, new stormwater management policies, and asset management.

7. SCHEDULE AND BUDGET

7.1 Requirement

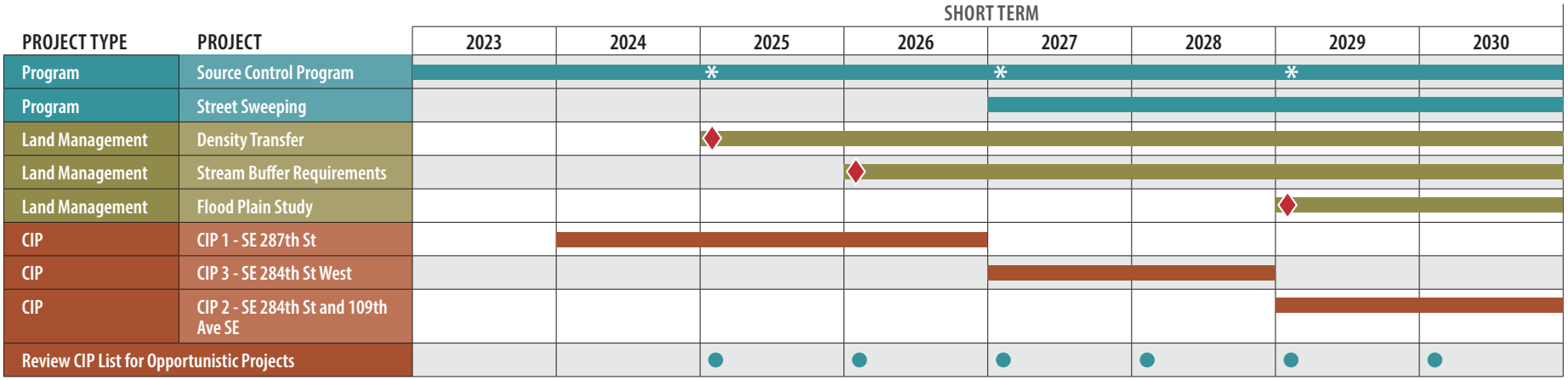
Permit Section S5.C.1.d.iii.(e) requirements for the SMAP are as follows.

> *A proposed implementation schedule and budget sources for:*
>
> - *Short-term actions (i.e., actions to be accomplished within 6 years, or from 2024 to 2030), and*
> - *Long-term actions (i.e., actions to be accomplished within 7 to 20 years, or from 2031 to 2044).*

7.2 Estimated Schedules and Budgets

Estimated scheduled and budgets are listed above for each proposed SMA in Sections 3 through 5 of this report and summarized below in Figure 4.

Short Term Implementation Schedule



RESOURCES USED PER YEAR

	2023	2024	2025	2026	2027	2028	2029	2030
Program	Employee Cost	Employee Cost	Employee Cost	Employee Cost	Employee Cost	Employee Cost	Employee Cost	Employee Cost
Land Management	None	Employee Cost	Employee Cost	Employee Cost	Employee Cost	Employee Cost	Employee Cost	Employee Cost
CIP	None	$127,333	$127,333	$127,333	$71,500	$71,500	$26,000	$26,000

Figure 4. Short-Term Schedule

7.3 Potential Grant Funding

The City is tracking the grant opportunities outlined below in Table 10 and may apply for funding for projects identified in this SMAP.

Table 10. Potential Grant Opportunities Applicable to SMAs

Program Name	Description
Washington State Department of Ecology	
Coastal Protection Fund – Terry Husseman Account	Support locally sponsored projects that restore or enhance the environment and provide primary benefits to public land or water resources and affiliated infrastructure.
Streamflow Restoration Competitive Grants	Help state and local agencies, Tribal governments, and nonprofit organizations implement local watershed plans and projects to improve streamflow and aquatic resources.
Water Quality Combined Funding Program	Integrated funding program for projects that improve and protect water quality. The program combines grants and loans from state and federal funding sources and provides technical assistance in navigating the process.
Integrated Planning Grants	These grants provide funding to local governments to conduct assessments of brownfield properties and develop integrated project plans for their cleanup and adaptive reuse.
Stormwater Capacity Grants Program	Awarded to NPDES municipal stormwater permittees to implement their municipal stormwater programs as outlined in the municipal stormwater permits.
Washington State Recreation and Conservation Office	
Aquatic Lands Enhancement Account	Used for the acquisition, improvement, or protection of aquatic lands for public purposes. They also may be used to provide or improve public access to the waterfront.
Habitat Conservation Projects – Washington Wildlife and Recreation Program	Funding for a broad range of land conservation efforts.
Land and Water Conservation Fund	The Land and Water Conservation Fund provides funding to preserve and develop outdoor recreation resources, including parks, trails, and wildlife lands.
Recreation Projects – Washington Wildlife and Recreation Program	Provides funding for a broad range of land protection and outdoor recreation, including park acquisition and development, habitat conservation, farmland preservation, and construction of outdoor recreation facilities.
Salmon Recovery and Puget Sound Acquisition and Restoration	Used to restore degraded salmon habitat and protect existing, high-quality habitat to increase the amount and overall health of the places salmon live.

8. FUTURE ASSESSMENT

Permit Section S5.C.1.d.iii.(f) requires the SMAP to include the following:

> *A process and schedule to provide future assessment and feedback to improve the planning process and implementation of procedures or projects.*

8.1 SMAP Evaluation Schedule

Each SMA identified in this plan will be reviewed based on the schedule outlined in Table 1.

8.2 SMAP Evaluation Process

During each review, the Future Assessment considerations listed in Tables 2 through 7 for each SMA will be evaluated. In addition, the status of the following progress metrics will be reviewed and documented:

1. Review the short- and long-term plans for updates on a regular basis (listed in each corresponding table).
2. Prepare a treatment coverage assessment. Identify and update changes every 2 years, including new development projects, implemented SMA projects, and other changes in protected or treated land areas.
3. Track the B-IBI scores over time and into the future against catchment project and program implementation. Complete a post-short-term evaluation (in approximately Year 8 [2032]) and additional evaluations approximately annually from Year 6 through Year 20.
4. Review and update the SMAP capital project schedule with the stormwater capital program schedule. Review for new coordinated and opportunistic projects.

9. CONCLUSION

The City identified the SMAs in this Olson Creek SMAP to address impacts from existing or planned development and provide improvements to the Olson Creek catchment area. All descriptions and details of the SMAs in this report are at the preliminary engineering level and may change as development of the SMAs progress. Implementation of these proposed actions will be tracked, evaluated, and updated through the future assessment process described above in the previous section to support continued progress toward protection and improvement of Olson Creek.

10. REFERENCES

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Appendix A

Receiving Water Assessment

Stormwater Management Action Plan (SMAP) Receiving Water Assessment

Prepared for

March 2022

Prepared by

Parametrix

SMAP Receiving Water Assessment

Prepared for

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www.parametrix.com

March 2022 | 553-1931-048

CITATION

Parametrix. 2022. SMAP Receiving Water Assessment.
Prepared by Parametrix, Seattle, Washington.
March 2022.

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APPENDICES

ACRONYMS AND ABBREVIATIONS

303(d)	Clean Water Act Section 303(d)
AU	assessment units
B-IBI	Benthic Index of Biotic Integrity
City	City of Auburn
Ecology	Washington State Department of Ecology
EJSCREEN Tool	Environmental Justice Screening and Mapping Tool
EPA	Environmental Protection Agency
Permit	Western Washington Phase II Municipal Stormwater Permit
PSWCM	Puget Sound Watershed Characterization Model
RM	river mile
SMAP	Stormwater Management Action Plan
SR	State Route
TMDL	Total Maximum Daily Load
WAC	Washington Administrative Code
WQI	Water Quality Index
WRIA	Water Resources Inventory Area

1. INTRODUCTION

1.1 Purpose

In 2019, the Washington State Department of Ecology (Ecology) updated the requirements for the National Pollutant Discharge Elimination System Western Washington Phase II Municipal Stormwater Permit (Permit). The Permit now requires the City of Auburn (City) and all other Phase II Permittees to develop a stormwater management action plan (SMAP) for at least one high priority catchment area by March 31, 2023, per S5.C.1.d. The SMAP will call for a comprehensive stormwater planning approach that will protect the designated uses of Washington waters by considering both the existing conditions and the state of expected future development. The SMAP is the final product of three sequential tasks, outlined below.

Task 1 – Receiving Water Assessment: This task involves assessing the existing conditions of the City's receiving waters.

Task 2 – Receiving Water Prioritization: This task involves selecting the receiving water and catchment area(s) that will be the focus of the City's SMAP.

Task 3 – SMAP Development: This task involves identifying stormwater management efforts that will improve the quality of the chosen receiving water and documenting the schedule and budget required to accomplish these efforts.

This report documents the receiving waters assessment for the City, required by S5.C.1.d.i of the Permit. The receiving waters were assessed in part using the methodology outlined in the Stormwater Management Action Planning Guidance (Ecology 2019). The results of this assessment will be used to support the prioritization process required by Section S5.C.1.d.ii of the Permit. The steps included in the assessment and this document are identified below.

1.2 Process Summary

The Ecology guidance includes a step-by-step process for preparing the receiving water assessment, as summarized below:

1. Basin delineation and identification of receiving waters, including a map of the delineated basins and the associated receiving waters.
2. Assessment of receiving water existing conditions and contributing areas for each delineated receiving water-scale basin and each receiving water body.
3. Assessment of expected stormwater management influence documenting how data sources were used in the assessment of existing conditions and any identified data gaps.
4. Evaluation of relative contributions and conditions summarized in a watershed inventory table, including the list of basins to be included in the prioritization process (S5.C.1.d.ii).

The Watershed Inventory Table and Map will be submitted to Ecology by March 31, 2022.

2. BASIN DELINEATION (STEP 1)

2.1 Methodology

The City includes portions of six named stream basins or receiving waters: Green River, Mill Creek, Mullen Slough, Olsen Creek[1], Soosette and Big Soos Creeks, and White River. Areas draining to these receiving waters were delineated into drainage basins, which were prepared by the City, and used as the basis for the receiving water analysis.

The basins were delineated to encompass the City area that drains to one of the identified receiving waters. Two receiving waters, the Green River and the White River, extend far beyond the City boundary and have subbasins much larger than the largest recommended SMAP basin area of 20 square miles (Ecology 2019). These receiving waters have been split into three reaches based on their location (i.e., lower, middle, upper), and the associated watersheds are shown in Figure 1.

The Lower Green River watershed, as shown in Figure 1, encompasses five of the receiving waters identified for the City: Green River, Mill Creek, Mullen Slough, Olsen Creek, and Soosette and Big Soos Creeks. The drainage area contributing to each of these receiving waters was delineated within the Lower Green River watershed. Thus, for the purposes of this assessment, the Green River drainage basin refers to the portion of the Lower Green River watershed that contributes to the Green River receiving water but does not include the areas draining to Mill Creek, Mullen Slough, Olsen Creek, and Soosette and Big Soos Creeks.

The Lower White River watershed, as shown in Figure 1, does not encompass any other identified receiving waters for the City, so this was used to represent the drainage basin for the White River.

Attributes were identified for each basin, as listed in Table 1, and described in the following sections.

[1] Sometimes referred to as Olson Creek in literature sources (Auburn 2015).

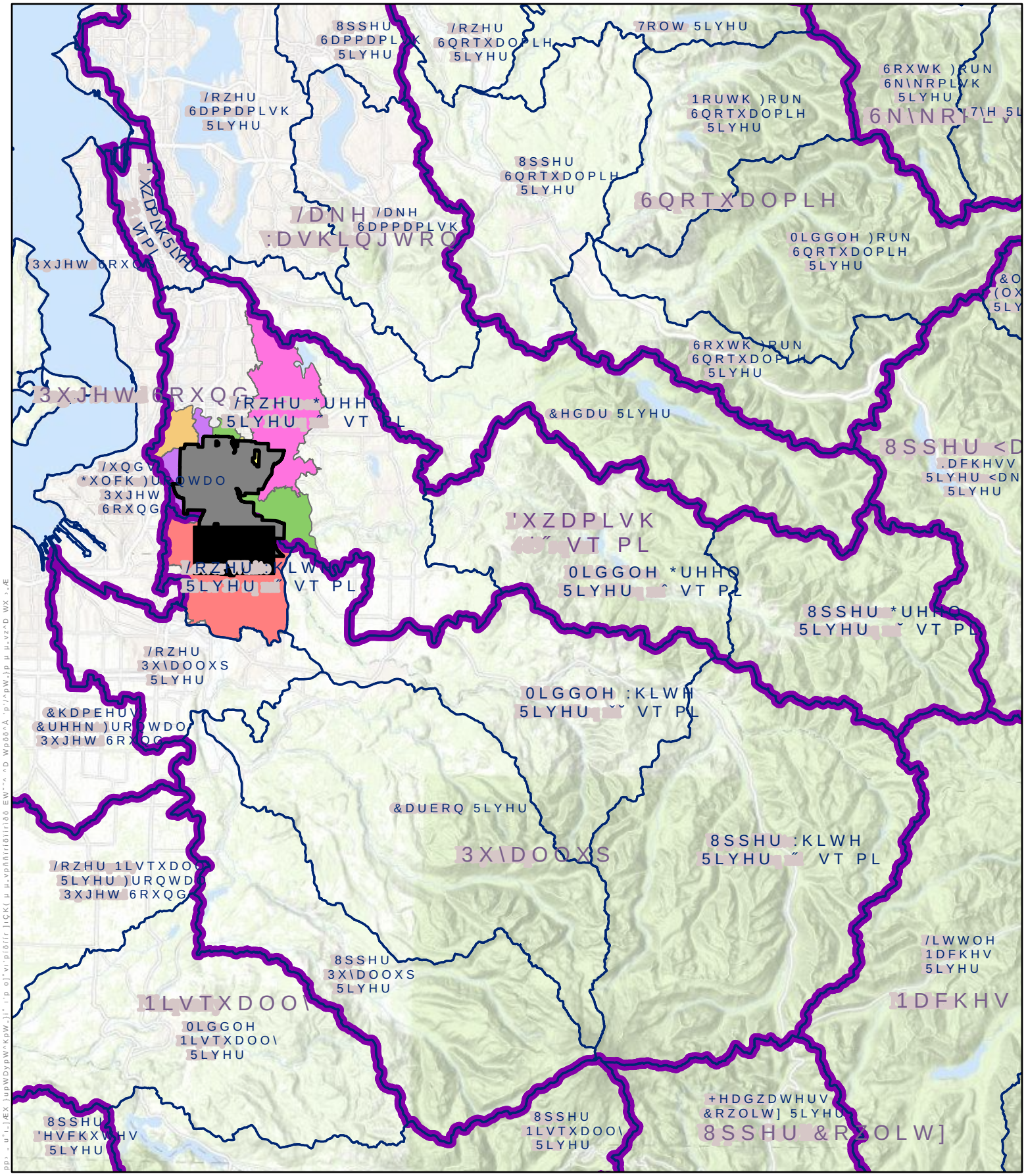

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Table 1. Basin Delineation Element Descriptions

Element	Description
Basin Name	Name of the drainage basin at a receiving water scale delineation. For the SMAP assessment, basins were limited to a scale of approximately 1–20 square miles within the City.
Receiving Water	The water body (stream segment, wetland, lake, large river, Puget Sound, etc.) that receives discharge from the associated basin listed in Table 1. The receiving water has been identified for all delineated basins in Table 1 and may be outside of City boundaries.
Total Drainage Basin Area	The total contributing basin area for the specified receiving water regardless of jurisdiction. For the purposes of this assessment, the portion of the Lower Green River watershed that receives runoff from the City and the Lower White River watershed (shown in Figure 1) were delineated and are referred to as the Green River and White River drainage basins, respectively. A footnote has been included in Table 2 for the Green River to distinguish between the area total for the Lower Green River watershed shown in Figure 1 and the delineated drainage basin used for this assessment shown in Figure 2.
Drainage Basin Area Within City	The total contributing basin area for the specified receiving water within City boundaries.
Percent of Total Drainage Basin Area Within City	The percentage of the Total Drainage Basin Area within City boundaries.
Percent of Total City Area Occupied by Drainage Basin	The percentage of the City encompassed by the Total Drainage Basin Area.

2.2 Receiving Water Drainage Basins

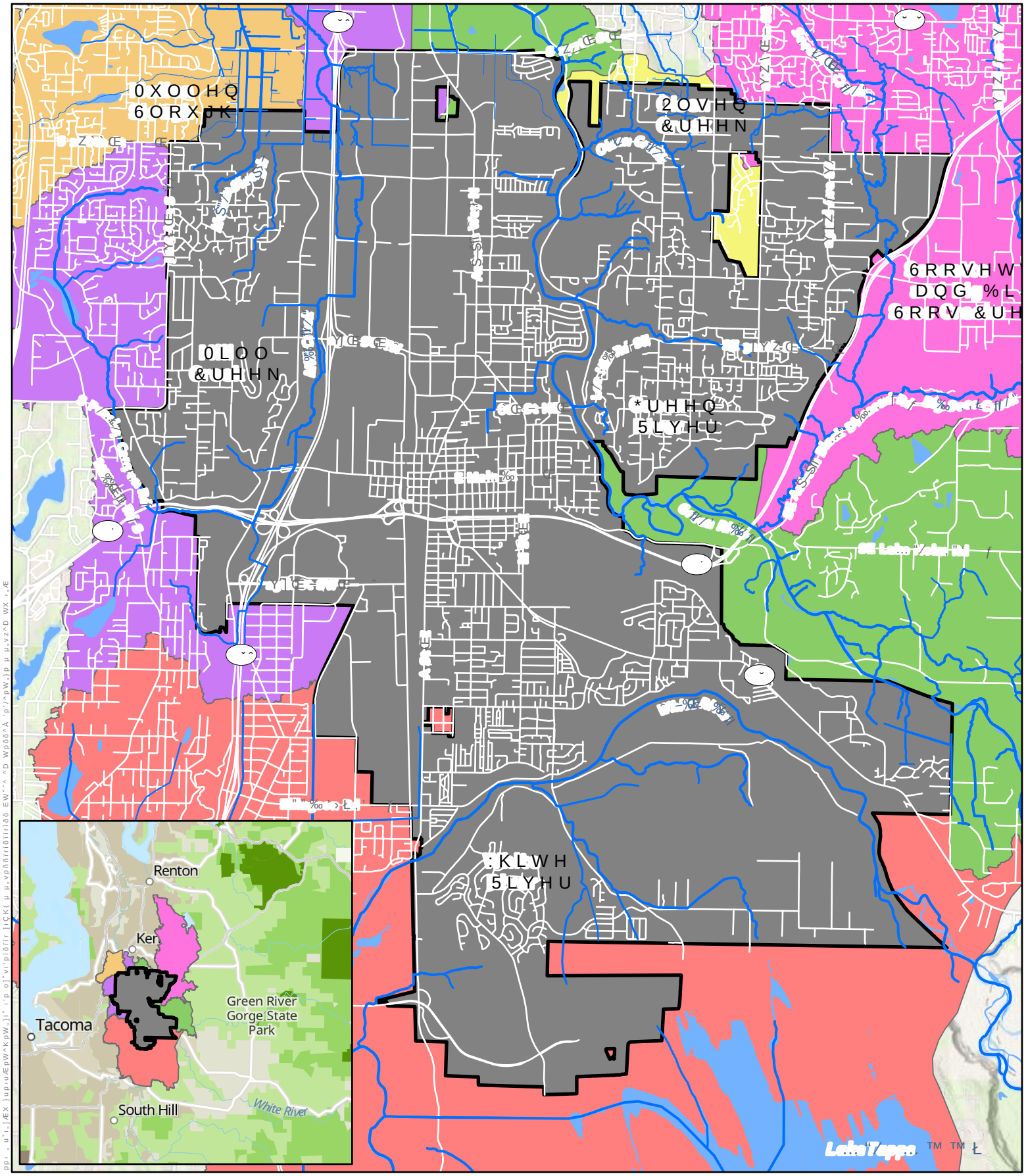
The results of the basin delineation (Step 1) have been summarized in Table 2. A map of the delineated basins is shown in Figure 2.

Table 2. Receiving Water Drainage Basins

Receiving Water Drainage Basin	Receiving Water	Total Drainage Basin Area (square miles)	Drainage Basin Area Within City (square miles)	Percent (%) of Total Drainage Basin Area Within City	Percent (%) of Total City Area Occupied by Drainage Basin
Green River	Lower Green River	18.1[a]	9.2	51.1% [b]	31.0%
Mill Creek	Mill Creek	13.0	7.6	58.5%	25.5%
Mullen Slough	Mullen Slough	5.5	0.6	10.8%	2.0%
Olsen Creek	Olsen Creek	1.7	1.3	75.4%	4.2%
Soosette and Big Soos Creeks	Soosette and Big Soos Creeks	27.5	1.9	6.7%	6.2%
White River	Lower White River	38.7	9.3	24.0%	31.1%

[a] This refers to the Green River drainage basin area delineated for use in this assessment, as shown in Figure 2. The total area of the Lower Green River watershed shown in Figure 1 is 194 square miles.

[b] This is relative to the Green River drainage basin area delineated for use in this assessment, as shown in Figure 2. The area of the Lower Green River watershed within City boundaries is 4.76 percent.



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2.3 Individual Basin Descriptions

A summary of each basin organized by receiving water is presented below, while detailed information on basin characteristics is presented Section 3.

2.3.1 Green River

The Green River has headwaters in the Cascade Mountains and flows 93 miles, meandering through the northeast portion of the City before ending in the Duwamish Waterway. The river has been altered for flood control several times, including for the diversion of the White River and the construction of the Howard A. Hanson Dam (Auburn 2015). The waterway is an important spawning, rearing, and migration corridor for several salmonid species (Ecology 2011a).

The Green River, together with the Duwamish River, is the largest freshwater component in Water Resources Inventory Area (WRIA) 9 and is bounded by the Duwamish subbasin, as shown in Figure 1. The following four watersheds have been identified within the Duwamish subbasin: Upper Green River, Middle Green River, Lower Green River, and Duwamish River. The portion of the City within the Duwamish subbasin lies within the Lower Green River watershed.

The Lower Green River watershed encompasses the Green River and four of its tributaries identified as City receiving waters: Mill Creek, Mullen Slough, Olsen Creek, and Soosette and Big Soos Creeks. For the purposes of this assessment, the Green River drainage basin refers to the delineated area shown in Figure 2 and does not include the area contributing to any of the aforementioned tributaries identified as receiving waters.

The Green River drainage basin, as delineated, contains the City area contributing stormwater runoff to the Green River and is thus more appropriate for assessing the City's relative influence on the receiving water. The Green River drainage basin is 18.1 square miles, and 51.1 percent of the basin is within the City compared to the total Lower Green River drainage basin, which encompasses 194 square miles and is only 4.8 percent within the City.

The Lower Green River, as defined by the extent of the HUC 8 watershed shown in Figure 1, flows from Green River Gorge State Park through the City to the confluence with the Black River in Tukwila. The City land cover in the Green River drainage basin is primarily residential and commercial (King County 2016a).

2.3.2 Mill Creek

Mill Creek has headwaters in the valley near State Route (SR) 18, turning north along the western portion of the City and running adjacent to SR 167, before ultimately discharging to the Green River 1 mile north of the City at river mile (RM) 23.8 (Ecology 2011a). The creek originates in Lake Dolloff and Lake Geneva and historically served as vital spawning, rearing, and migration water for salmonids (King County 2016b). More recently, the stream is mostly straight and narrow and lacks quality riparian habitat for species listed under the Endangered Species Act (Auburn 2015).

The creek is entirely within the Lower Green River watershed and is approximately 8.35 miles long (King County 2016b). The City has documented drainage outfalls to Mill Creek becoming submerged occasionally due to flooding issues related to aggradation, reducing the hydraulic capacity of the creek (Auburn 2015). The area contributing to Mill Creek is intersected by several highways and roads and is largely composed of commercial and industrial land cover (Ecology 2011a). The western basin boundary is residential and the remaining area along the creek has large areas of open space with several wetlands (King County 2016b).

2.3.3 Mullen Slough

Mullen Slough, a major tributary to the Lower Green River, drains along the northwest side of Mill Creek before discharging into the Green River (Auburn 2015). The Mullen Slough and Mill Creek together drain most of the remaining agricultural areas in the Lower Green River watershed (Ecology 2011a).

Historically, Mullen Slough conveyed water from nearby wetlands to the Green River and was important for flood storage as well as for providing refuge to salmonids during winter high flows. There has been documentation of juvenile coho salmon and rainbow and cutthroat trout using portions of Mullen Slough. However, several flow barriers exist throughout the slough as a result of water withdrawals, wetland filling, channel encroachment, and hanging culverts. Upper Mullen Slough has been severely channelized due to suburban development (King County 2000).

2.3.4 Olsen Creek

Olsen Creek is approximately 3 miles in length (including tributaries) and drains just over 2,000 acres from within the Lower Green River watershed. The creek originates on a plateau that is 350 to 500 feet in elevation and receives surface water from three wetlands before descending to the valley floor, where it meets the Green River. Increased erosion and sedimentation have been observed due to anthropogenic activity—sediment has been documented to accumulate at the confluence with the Green River. Upstream of RM 0.17, there is a second-growth deciduous forest, but downstream there is a lack of riparian corridor. Urban growth has been slower in this basin compared to other receiving water basins in the City because there are sensitive-area restrictions on development (King County 2000).

2.3.5 Soosette and Big Soos Creeks

Soosette Creek runs through the northeastern corner of the City before draining southeast into mainstem Big Soos Creek at RM 1.35 outside of the City boundaries (King County 2007). Big Soos Creek originates in a glacial outwash plain, descends through a steep ravine, and then gradually decreases in gradient to less than 1 percent before draining southwest to the Lower Green River at RM 33.7 (King County 2000). Land use within the Soosette Creek basin is largely residential, primarily low to medium density (King County 2007).

The Soos Creek system is an important biological network—several salmonid species have been observed spawning throughout, and the Soos Creek State Fish Hatchery, just upstream of the confluence with the Green River, has been in continuous operation since 1901 (King County 2000).

2.3.6 White River

The White River has headwaters on Mount Rainier and flows northwest through the Puget Sound lowlands, meandering through the southern portion of the City before curving southwest to meet the Puyallup River.

The White River historically flowed to the Green River, but its floodwaters would also flow to the Puyallup River. As a consequence of a flood in 1906, the White River shifted its flow path away from the Green River and towards the Puyallup River via the old Stuck River channel. As a result, the White River is contained within the Puyallup subbasin. The following six watersheds have been identified within the Puyallup subbasin: Upper White River, Middle White River, Lower White River, Carbon River, Upper Puyallup River, and Lower Puyallup River.

The portion of the City within the Puyallup subbasin lies within the Lower White River watershed. The watershed did not contain any other identified receiving waters for the City and was used to represent the White River drainage basin for the purposes of this assessment. In 1948, the U.S. Army Corps of Engineers constructed the Mud Mountain Dam to control flooding on the White River. Vegetation encroachment and sediment accumulation have reduced the river's channel capacity in the City from the estimated 20,000 cubic feet per second post initial construction of the dam. During large storm events, the White River's reduced channel capacity and higher river levels may impact the City's gravity drainage outfalls along the waterway. The White River receives stormwater from the largely developed south central portion of the City as well as from the Boeing property (Auburn 2015).

3. CONDITION ASSESSMENT (STEP 2)

3.1 Methodology

To best understand the existing condition of the City's receiving waters, water quality was assessed independently of the watershed. After collecting the data for each receiving water, a broad understanding of level of impairment can be associated with each contributing drainage area and used as an element in guiding which basins should be considered for prioritization. Higher prioritization may be given to those receiving waters with low to moderate signs of impairment, per Ecology's prioritization guidance (Ecology 2019). The data sources used for the existing condition assessment of the identified receiving waters are outlined in Table 3 below.

Table 3. Receiving Water Condition Assessment Data

Data Type	Source	Last Updated	Description of Assessment
Water Quality			
Designated Uses	Chapter 173-201A Washington Administrative Code (WAC Parts IV and II, respectively); Ecology Publication 06-10-038[a]	2021; 2011	Designated uses for receiving waters were identified, allowable thresholds for pollutant concentrations were recorded, receiving waters with supplemental spawning and incubation protections within the City were identified and mapped accordingly.
Water Quality Conditions	King County Water Quality Index (WQI)[b]	Water Year 2020	Reviewed WQI scores of receiving waters at available King County WQI program monitoring stations in or near City boundaries.
	Ecology's Freshwater Information Network[c]	2022	Reviewed physiochemical data for receiving waters where King County WQI and Benthic Index of Biotic Integrity data was unavailable.
	Ecology Washington State Water Quality Assessment 303(d) Candidate List and Water Quality Atlas[d]	2018	Receiving water impairments were identified and summarized in a water quality table and interactive web map.
	Ecology Directory of Water Quality Improvement Projects[e]	2011	Collected and reviewed watershed specific total maximum daily load (TMDL) studies and water quality improvement projects for receiving waters relevant to the study area.
Biological Condition	Puget Sound Stream Benthos[f]	1994–2021	Collected available data related to biological condition from the Benthic Index of Biotic Integrity (B-IBI), developed by a coalition led by King County, which assesses overall biological condition.

Data Type	Source	Last Updated	Description of Assessment
Watershed Condition			
Land Cover	City of Auburn GIS	2016-2022	City land cover layers were updated using aerial information to reclassify into the land cover categories needed for the analysis. The data was added to the web map.
Buildable and Vacant Lands	Information to be provided by the City in the prioritization step	TBD	City vacant and buildable lands information to be used in prioritization.
Watershed Characterization	Puget Sound Watershed Characterization Model (PSWCM)[g]	2016	Used the Ecology PSWCM interactive mapping tool to score receiving water basins within the City and their associated watersheds for the ecological value of water flow, water quality, and fish and wildlife habitat using the model.
Public Health and the Environment	EJSCREEN Tool – Demographic Index (U.S. Census Bureau Estimates)[h]	2014–2018	The Combined Equity Index was created by combining Environmental Justice Screening and Mapping Tool (EJSCREEN Tool) Demographic and Environmental Hazards Indices with the Environmental Opportunity Index developed by Parametrix.
	EJSCREEN Tool – Environmental Hazards Index (informed by a combination of collected data and various Environmental Protection Agency (EPA) models, studies and regulations)[i]	2006–2019	
	Environmental Opportunity Index – based on land cover data including tree canopy, parks, open spaces, and golf courses	2016-2022	

Sources: [a] Ecology 2011; [b] King County 2020; [c] Ecology 2022; [d] Ecology 2018; [e] Ecology 2021; [f] King County 2021; [g] Ecology 2016b; [h] U.S. Census Bureau 2020; [i] EPA 2019

3.2 Water Quality

Water quality for the City's receiving waters is summarized in Table 4 and discussed in the following sections.

3.2.1 Designated Uses

Ecology has defined four groups of designated uses for surface water within the state of Washington. Designated uses for City receiving waters are listed in in Table 4. Water quality criteria have been identified, and thresholds for the relative condition of Washington's water bodies have been set for each designated use. Appendix A provides additional information regarding the designated uses and applicable thresholds for Washington's surface waters per WAC 173-201A-200 as well as the City's receiving waters and assigned uses identified in Table 602 of WAC 173-201A-600. In addition, receiving waters were compared to the maps from Ecology Publication 06-10-038 (Ecology 2011b) to determine where additional supplemental spawning standards have been set. Maps indicating waterbodies with additional supplemental spawning standards have been included in Appendix A.

3.2.2 Water Quality Index

The Water Quality Index (WQI) is a score generated by King County using a unitless number ranging from 10 to 100. The index expresses modeled results for temperature, pH, fecal coliform, bacteria, and dissolved oxygen relative to the levels required to maintain uses according to the criteria specified in WAC 173-201A. For nutrient and sediment measures, where standards are not specified, results are specified relative to expected conditions in a given ecoregion. Multiple constituents are then combined and aggregated over periods of time to produce scores for each sampling station, where data is collected (King County 2020).

Data from monitoring stations with sources other than King County can be scored using Ecology's Water Quality Index spreadsheet, which was used to develop the scoring system described above (Ecology 2014).

3.2.3 State Water Quality Assessment

3.2.3.1 Assessment

The federal Clean Water Act requires states to perform a water quality assessment every 2 years to track the health of surface waters such as rivers, lakes, and marine water bodies, with a long-term goal of restoring their water bodies to be "fishable and swimmable." The assessed water bodies are placed into categories that describe water quality.

For the purposes of this data summary, only waters in Categories 4 and 5 have been considered in assessing the City's receiving water impairments. Category 4 impairments are not part of the 303(d) list; while they are still impaired, they do not require a state total maximum daily load (TMDL) for the following reasons: impairments in the 4A category have an Environmental Protection Agency (EPA)-approved TMDL; those in the 4B category have a pollution control program that is being actively implemented by a local, state, or federal program or strategy; and those in the 4C category have impairments caused by a type of pollution that cannot be addressed effectively through implementation of a TMDL. Category 5 can be defined as water bodies whose designated uses (such as for drinking, recreation, aquatic habitat, and industrial use) are impaired by a pollutant and require the development of a water quality improvement project to address the pollution. All waters in these categories have persistently failed to meet applicable water quality standards for their impaired parameter(s) (Ecology 2020).

3.2.3.2 303(d) List

The 303(d) list, guided by federal laws, state water quality standards, and Ecology's Water Quality Assessment Policy 1-11 identifies water bodies in the polluted water Category 5. Ecology's 2018 Water Quality Assessment identifies water quality impairments in the receiving water basins (Ecology 2018). The known impairments have been summarized in Table 4, presented in Figure 3, and the full analysis of the available data can be found in Appendix A.

3.2.3.3 Total Maximum Daily Load (TMDL)

The TMDL is a plan for cleaning up polluted waters in order to meet state water quality standards. The federal Clean Water Act requires states to develop water quality improvement projects known as TMDLs for Category 5 impaired waterbodies identified on the 303(d) list. A TMDL plan begins with determination of the highest amount of pollutant loading that a surface water body can receive and still meet water quality standards, followed by monitoring and analysis. Monitoring helps identify sources and amounts of pollutants causing water quality issues, and the technical analysis determines the pollution reduction measures necessary to protect each waterbody (Ecology 2020). Once EPA approves a TMDL, the plan is implemented, and the monitoring process provides data to reflect the status of a water body's health. When water quality standards are met, the assessment status is changed to Category 1: Meets tested standards for clean waters. Any known TMDLs associated with a 303(d)-listed water quality impairment that has been identified in one of the City's receiving water basins have been summarized in Table 4.

Table 4. Receiving Water Quality Data Summary

Receiving Water	Designated Uses (173-201A WAC)	King County WQI Score[a]	Water Quality Assessment Listings[b]			Benthic Index of Biotic Integrity (B-IBI)		
			Category	WQ Parameter	TMDLs in the Basin	Stream Name (Site ID)	Overall Score	Biological Condition
Green River	Aquatic Life Uses • Salmonid spawning, rearing, and migration • Core summer salmonid habitat Recreational Uses • Primary contact recreation Water Supply Uses • Domestic, industrial, agricultural, and livestock Miscellaneous Uses • Wildlife habitat, harvesting, commerce/navigation, boating and aesthetics	Good	5	Bioassessment (B-IBI)	Green River Temperature Watershed TMDL	Green River (1976)	36.7	Poor
			5	Dissolved Oxygen[c]		Green River (1004)	12.3	Very Poor
			4A	Temperature[c]		Green River – Lower Tributary 0069 (241)	15.6	Very Poor
Mill Creek	Aquatic Life Uses • Salmonid spawning, rearing, and migration Recreational Uses • Primary contact recreation Water Supply Uses • Domestic, industrial, agricultural, and livestock Miscellaneous Uses • Wildlife habitat, harvesting, commerce/navigation, boating and aesthetics	Moderate	5	Bacteria (Fecal coliform)	Green River Temperature Watershed TMDL	Mill Creek (250)	50.2	Fair
			5	Bioassessment (B-IBI)		Mill Creek (251)[d]	44.9	Fair
			5	Dissolved Oxygen		Mill Creek (252)[e]	52	Fair
			5	pH		Mill Creek (253)	0.3	Very Poor
			4A	Temperature		Mill Creek (325)[d]	50.5	Fair
						Mill Creek (326)	9.9	Very Poor
						Mill Creek (324)[e]	52.5	Fair

Table 4. Receiving Water Quality Data Summary (continued)

Receiving Water	Designated Uses (173-201A WAC)	King County WQI Score[a]	Water Quality Assessment Listings[b]			Benthic Index of Biotic Integrity (B-IBI)		
			Category	WQ Parameter	TMDLs in the Basin	Stream Name (Site ID)	Overall Score	Biological Condition
Mullen Slough	Aquatic Life Uses • Salmonid spawning, rearing, and migration Recreational Uses • Primary contact recreation Water Supply Uses • Domestic, industrial, agricultural, and livestock Miscellaneous • Wildlife habitat, harvesting, commerce/navigation, boating and aesthetics	No data	5	Bacteria (Fecal coliform)[c]	Green River Temperature Watershed TMDL	Bingamon Creek (312) Mullen Slough (238)	27.9 7	Poor Very Poor
			5	Bioassessment (B-IBI)[c]				
			4A	Temperature[c]				
Olsen Creek	Aquatic Life Uses • Core summer salmonid habitat Recreational Uses • Primary contact recreation Water Supply Uses • Domestic, industrial, agricultural, and livestock Miscellaneous Uses • Wildlife habitat, harvesting, commerce/navigation, boating and aesthetics	No data	5	Bioassessment (B-IBI)	Green River Temperature Watershed TMDL	Olsen Creek (239)	82.5	Excellent
			4A	Temperature				

Table 4. Receiving Water Quality Data Summary (continued)

Receiving Water	Designated Uses (173-201A WAC)	King County WQI Score[a]	Water Quality Assessment Listings[b]			Benthic Index of Biotic Integrity (B-IBI)		
			Category	WQ Parameter	TMDLs in the Basin	Stream Name (Site ID)	Overall Score	Biological Condition
Soosette and Big Soos Creeks	Aquatic Life Uses • Core summer salmonid habitat Recreational Uses • Primary contact recreation Water Supply Uses • Domestic, industrial, agricultural, and livestock Miscellaneous Uses • Wildlife habitat, harvesting, commerce/navigation, boating and aesthetics	Good	5 5	Bacteria (Fecal coliform) Bioassessment (B-IBI)[c]	Soos Creek Watershed Fecal Coliform TMDL (In development) Soos Creek Multiparameter TMDL (In development)	Big Soos Creek (262)	69.8	Good
			5	Dissolved Oxygen[c]		Soos Creek (267)	48.8	Fair
			5	Temperature		Soos Creek (1977)	48.9	Fair
						Soos Creek (1997)	48.8	Fair
						Soos Creek (1617)	82.3	Excellent
						Soosette Creek (263)	64.3	Good
						Soosette Creek (264)	63.6	Good
						Soosette Creek (1932)	72.3	Good
						Soosette Creek (1933)	69.4	Good
White River	Aquatic Life Uses • Salmonid spawning, rearing, and migration • Core summer salmonid habitat Recreational Uses • Primary contact recreation Water Supply Uses • Domestic, industrial, agricultural, and livestock Miscellaneous Uses • Wildlife habitat, harvesting, commerce/navigation, boating and aesthetics	Moderate[f]	5[c]	Dissolved Oxygen	Lower White River pH TMDL (in development) Puyallup River Bacteria TMDL	No data		
			5[c] 5[c] 4A 4C[c,g]	pH Temperature Bacteria (fecal coliform) Instream Flow				

[a] WQI scores and status: **poor** (40 and below) – does not meet expectations, highest concern; **moderate** (40 to 80) – of moderate concern; **good** (80 and above) – meets expectations, lowest concern (King County 2020). The WQI was developed to score water quality for streams and rivers using stream monitoring gauge data.

[b] Includes all tributaries in the delineated receiving water basin. If a receiving water had several impairments for the same parameter, it was combined into one row for presentation in Table 4.

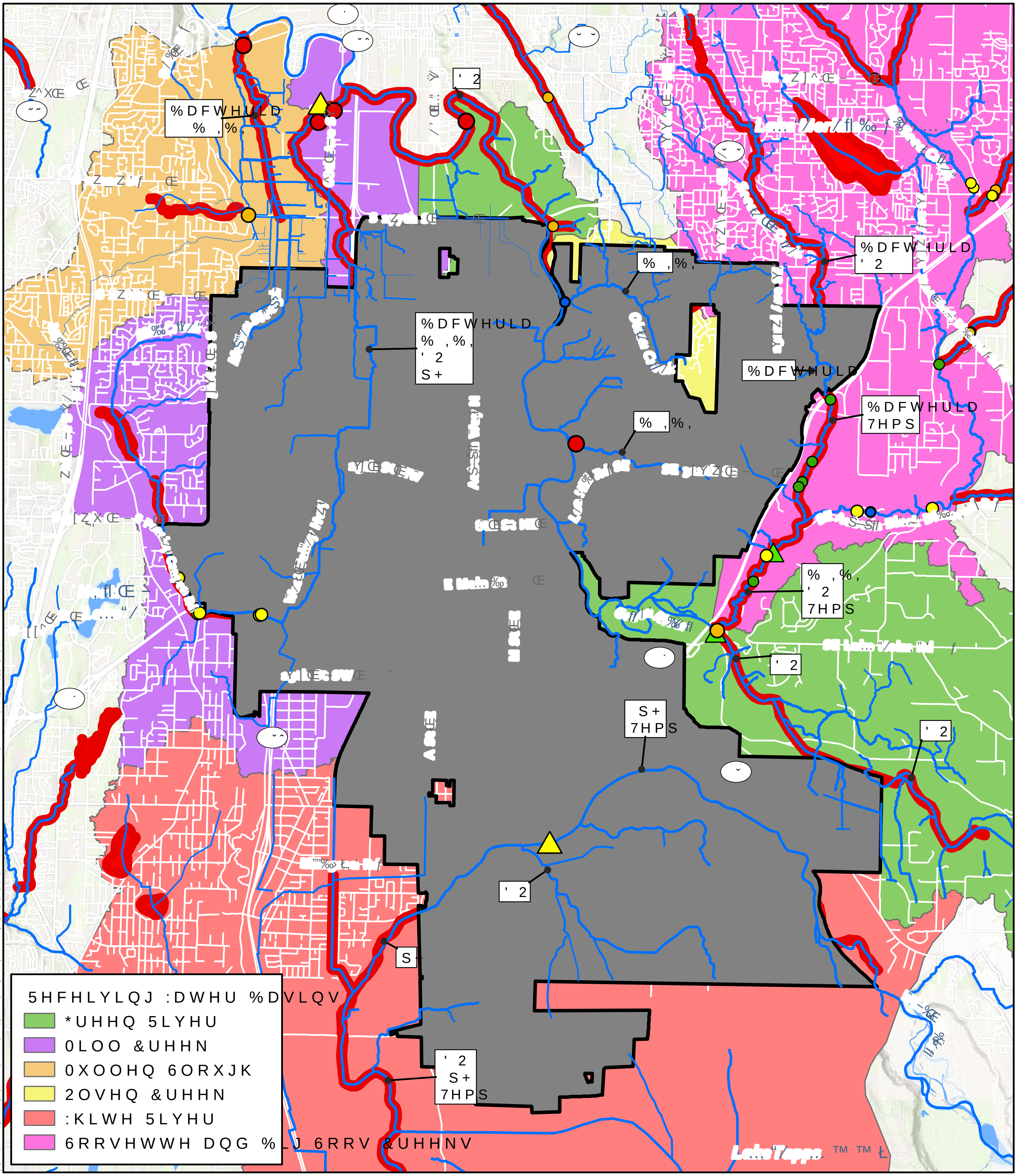
[c] At least one impairment for the parameter listed is entirely outside of City boundaries.

[d] Mill Creek B-IBI stations 251 and 325 were sampled in close proximity to one another and are shown to overlap in Figure 3.

[e] Mill Creek B-IBI stations 252 and 324 were sampled in close proximity to one another and are shown to overlap in Figure 3.

[f] King County monitoring data unavailable. WQI calculated using Ecology's Water Quality Index spreadsheet (Ecology 2014). See Appendix A for spreadsheet calculation

[g] The impairment is listed as a result of inadequate stream flows from the Puget Power's White River Hydroelectric project, outside of City boundaries. See Appendix A for the impairment listing.



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3.2.4 Biological Condition

The Puget Sound Stream Benthos, a data repository and analysis tool indicating biological health of streams throughout the Puget Sound, was used to aid in the assessment of the biologic condition of the City's receiving waters. The stream benthos indicates the region in or near a streambed. Benthic macroinvertebrates, animals that live within the stream benthos, are crucial to the stream ecosystem and are good indicators of the overall health of a stream. The tool uses benthic macroinvertebrate data to assess stream ecological health. A decline in stream biodiversity can be indicative of altered flow regimes; changes in runoff constituents; organism exposure to flashier hydrographs; elevated levels of contaminants and nutrients; or altered channel stability and morphology (King County 2015).

The database uses the Puget Sound Lowlands Benthic Index of Biotic Integrity (B-IBI) scoring system to assess the relative health of a stream. The overall B-IBI score used in this analysis is the summation of 10 metrics related to the taxa richness of various indicator macroinvertebrates within the stream. Each metric is assigned a score of 1 to 10, and the overall B-IBI score ranges from 1 to 100. A high score is representative of a stream in excellent biological condition, and a low score is a stream in very poor biological condition (King County 2015). Table 4 summarizes available data on the biological condition of monitored streams, and a full description of parameters and scoring elements has been provided with the water quality data included in Appendix A.

3.3 Watershed Condition

The condition of each drainage basin was assessed separately to help explain the results of the water quality assessment and predict how future development may factor into the condition of the receiving waters. As part of the prioritization task, the drainage basins will need to be evaluated for retrofit suitability and, within each basin, areas that necessitate water quality management actions—including conservation, protection, and restoration—will need to be identified. Assessing the watershed condition of each basin can thus begin to inform the appropriateness for carrying a drainage basin on for prioritization.

The following sources were used to assess the watershed condition for each basin.

3.3.1 Land Cover

The City provided a land cover layer that was updated using Lidar survey performed in 2016 and reformatting it into the land cover categories that will be needed for the analysis performed for prioritization. A preliminary map has been generated that displays the existing land cover and is presented in Figure 4.

3.3.2 Buildable and Vacant Lands

The City will provide information for the buildable and vacant lands in the next phase of the SMAP analysis. In the upcoming prioritization process, the latest draft version of available data will be used in the analysis to forecast areas of projected or targeted growth, score and rank sub-catchments, and evaluate impacts to the watershed.

3.3.3 Puget Sound Watershed Characterization Model

Ecology has developed a mapping tool, the Puget Sound Watershed Characterization Model (PSWCM), that can be used to support stormwater management planning. The PSWCM includes different categories

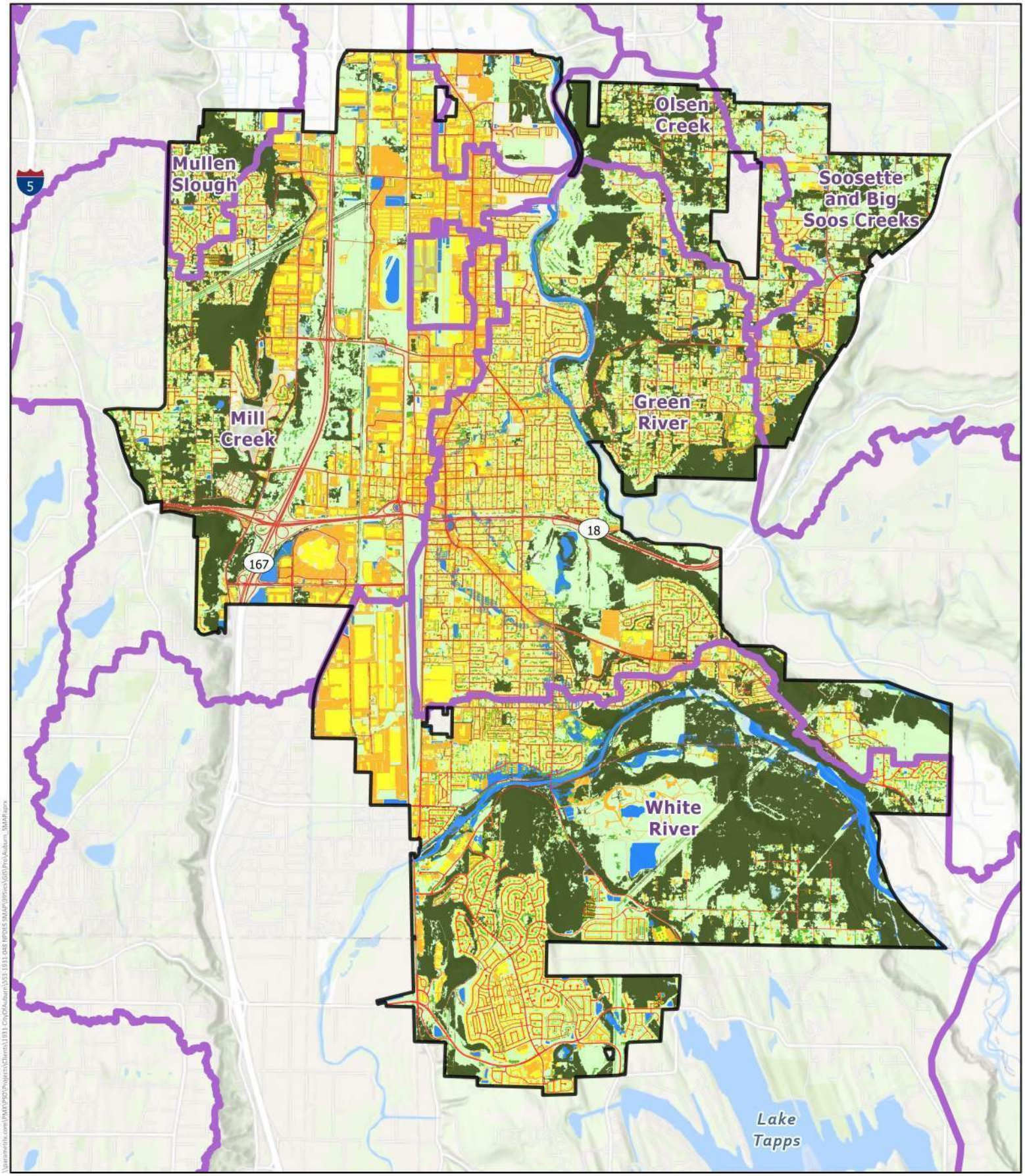
for water flow, water quality, and fish and wildlife habitats. The PSWCM provides color-coded maps that show the restoration and protection value of small watersheds and marine shorelines in the Puget Sound Basin, also known as assessment units (AUs), by comparing factors based on the assessed importance of flow, water quality, and habitat processes in sub-models. The relative value is determined by the potential importance of the area to ecological processes or values, such as water delivery, sediment delivery, or habitat/species conservation. Scores ranged from 1 to 16, where a score of 16 would be representative of a basin with high potential importance to ecological processes or values, and a score of 1 would be representative of a basin with low potential importance (Ecology 2016a and 2016b).

The overall scores for the City were determined by summing the scores for the selected ecological processes or values, which were weighted by a sub-model to match updated City basins. For the basin area within City boundaries, the model AUs were clipped to the City boundary and summed according to their relative contribution. The same process was used to find scores for the watersheds, clipping according to the watershed boundaries delineated by King County (King County 2018). The PSWCM and City results are presented in Table 5 and Figures 5 and 6. The methodology of how the model weighted and summed the sub-model inputs for water flow, water quality, and fish and wildlife habitat components—as well as the full description of model parameters, inputs, calculations, maps, and results—are presented in are detailed in Appendix B.

Table 5. Puget Sound Watershed Characterization Model Scoring[a]

Basin Name	Basin Area Within City Boundary (square miles)	Overall Score Within City Boundary	Total Drainage Basin Area (square miles)	Overall Score of Total Drainage Basin
Green River	9.2	11.70	18.1	12.06
Mill Creek	7.6	10.17	13.0	10.07
Mullen Slough	0.6	10.00	5.5	10.14
Olsen Creek	1.3	11.84	1.7	11.26
Soosette and Big Soos Creeks	1.9	10.05	27.5	11.84
White River	9.3	11.46	38.7	10.44

[a] Scoring summations would be translated to quartiles as follows: High – 16; Moderate-high – 12; Moderate – 8; and Low – 4



Date: 2/16/2022
Sources: City of Auburn, King County, Pierce County, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

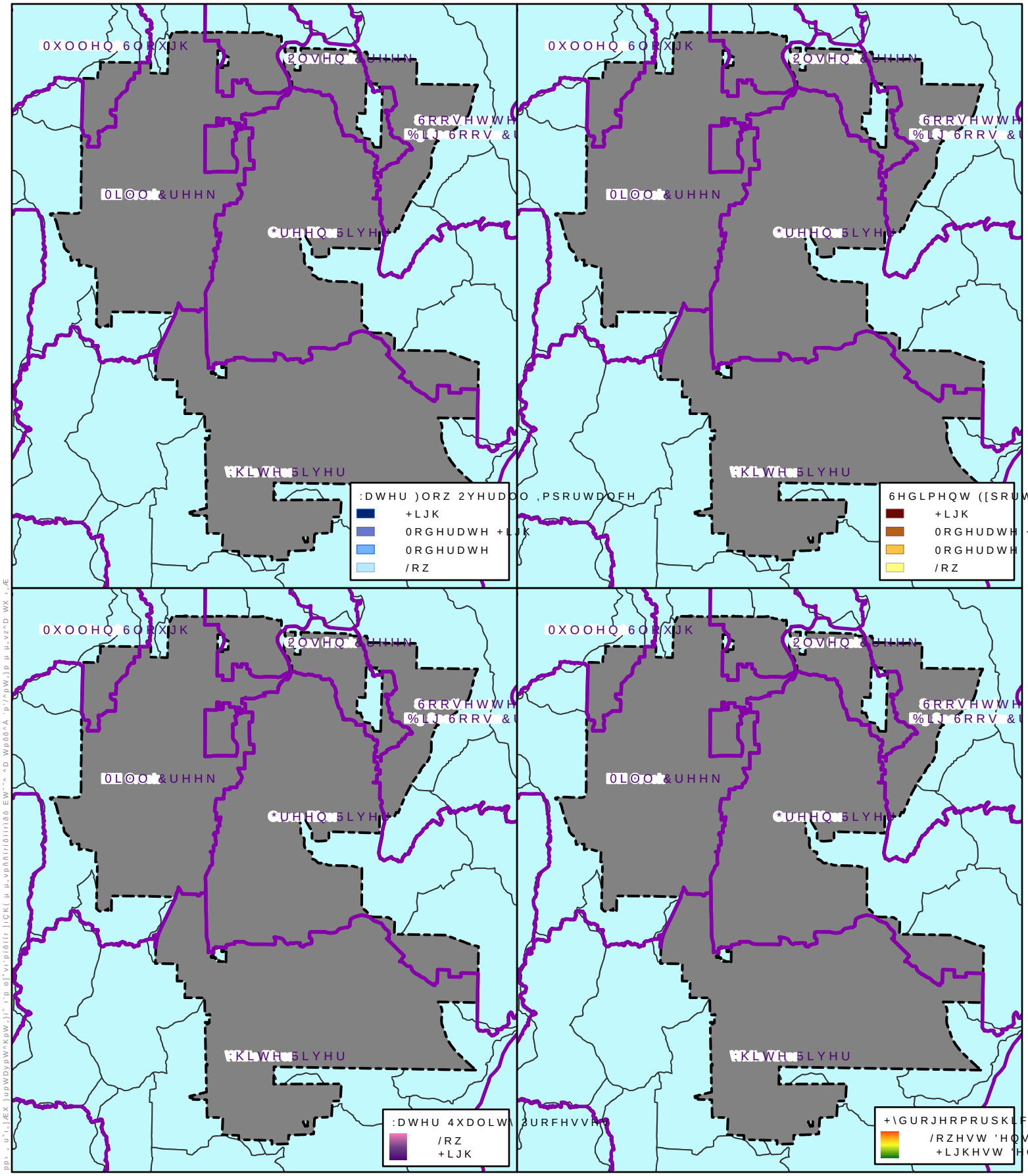
Auburn City Limits
Stream
Receiving Water Basins

Land Cover
Road
Parking
NPGIS
Grass/Landscape
Forest Canopy
Tree
Water

0 2,000 4,000 Feet

Figure 4 - Land Cover
Auburn SMAP
Receiving Water Assessment

Auburn, WA



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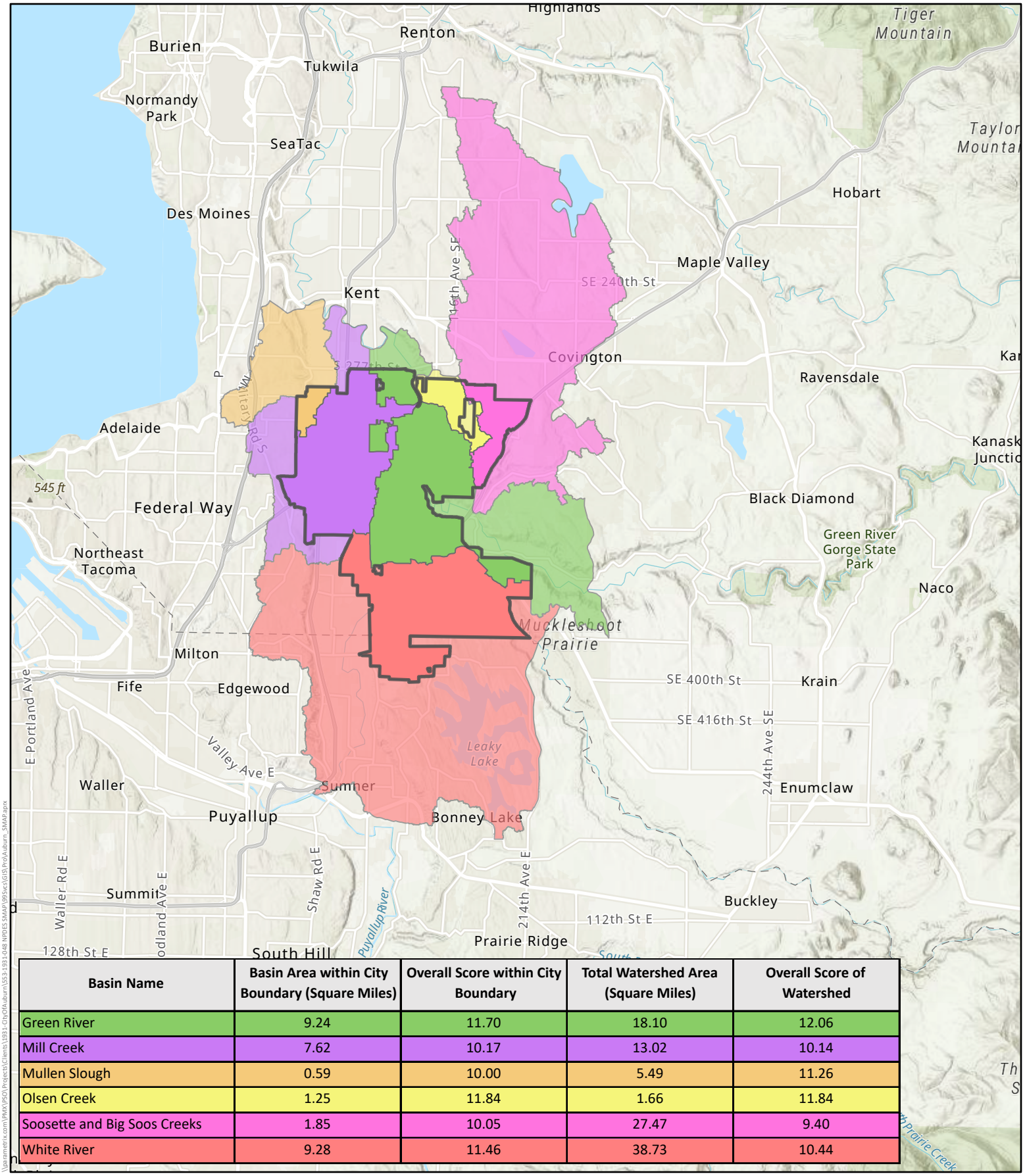

Basin Name	Basin Area within City Boundary (Square Miles)	Overall Score within City Boundary	Total Watershed Area (Square Miles)	Overall Score of Watershed
Green River	9.24	11.70	18.10	12.06
Mill Creek	7.62	10.17	13.02	10.14
Mullen Slough	0.59	10.00	5.49	11.26
Olsen Creek	1.25	11.84	1.66	11.84
Soosette and Big Soos Creeks	1.85	10.05	27.47	9.40
White River	9.28	11.46	38.73	10.44

Date: 2/16/2022
Sources: City of Auburn, King County, Pierce County, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

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Figure 6 - Puget Sound Watershed Characterization Model Output Summary
Auburn SMAP
Receiving Water Assessment

Auburn, WA

3.4 Public Health and the Environment

3.4.1 Environmental Justice Screening and Mapping Tool

The EPA has developed a web-based tool known as the Environmental Justice Screening and Mapping Tool (EJSCREEN Tool) (EPA 2019) that uses national data to support a wide range of research and policy goals. The EJSCREEN Tool supports these goals by informing an understanding of where the impacts of existing pollution may be the greatest by filing certain data gaps to ensure these areas are not overlooked so they may receive appropriate consideration, analysis, and outreach when policies are developed to protect and improve public health and the environment in an equitable way. EJSCREEN puts each indicator or index value in perspective by reporting the value as a percentile. The indicators listed in Table 6 were selected from the EJSCREEN Tool to be analyzed during prioritization because they are related to the management of surface water and stormwater resources.

Table 6. EJSCREEN Tool Indicators

Demographic Index Indicators[a]	Environmental Index Indicators[b]
Low Income	NATA Air Toxics Cancer Risk
Minority	NATA Respiratory Hazard Index
Individuals Over the Age 25 with Less Than a High School Education	NATA Diesel PM
	Particulate Matter
Individuals in Linguistic Isolation	Ozone
Individuals Under Age 5	Traffic Proximity and Volume
Individuals Over Age 64	Proximity to Risk Management Plan Sites
	Proximity to Treatment, Storage, or Disposal Facilities for Hazardous Waste
	Proximity to National Priorities List Sites
	Wastewater Discharge
	Lead Paint Indicator

[a] U.S. Census Bureau 2020
[b] EPA 2019

3.4.2 The Environmental Opportunity Index

The Environmental Opportunity Index was developed to complement the indices sourced from the EJSCREEN tool to create a single Combined Equity Index score. This Index was developed by scoring canopy cover and park/open space access using GIS data and joining it to the existing block groups to identify areas with the greatest need or areas that could benefit the most from gaining greater access to these resources. In this Index, areas with the lowest canopy cover or the least access to parks or open spaces would be identified as having the highest need.

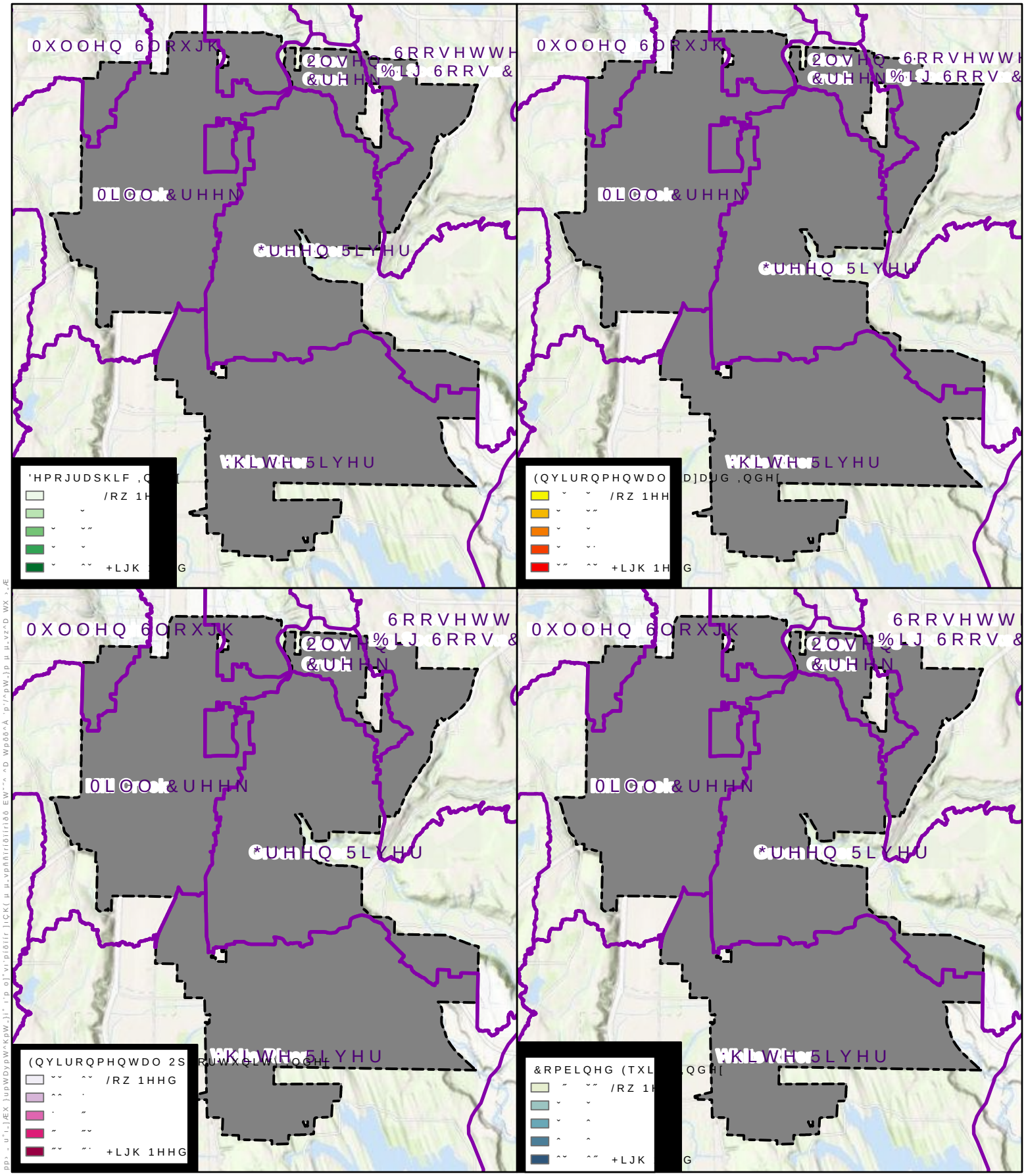
3.4.3 The Combined Equity Index

The equity layer, or the Combined Equity Index, was developed by averaging the scores from the EJSCREEN Demographic Index, EJSCREEN Environmental Hazard Index, and an Environmental Opportunity Index prepared for this analysis. The weighting of the indicators for each index is equal in the preliminary analysis but will be adjusted in the prioritization phase through public engagement and stakeholder inputs to the process in order to meet the specific identified needs. A summary of the three input indices and the resulting Combined Equity Index Score is presented in Table 7 and Figure 7, and a full description the inputs and preliminary scores it generated are provided in Appendix C.

In general, a basin with a higher demographic index score is indicative of a basin with a higher population of individuals that identify with the indicators listed in Table 6. A basin with a high environmental index score is indicative of a basin with higher potential exposure to environmental pollutants. As previously discussed, a basin with a high environmental opportunity index score is indicative of an area with the highest need for additional canopy cover and more parks/open space access. A high combined equity score is reflective of high component scores and could be used to identify basins where environmental justice efforts may be most beneficial.

Table 7. Environmental Justice and Opportunity Index Scores

Basin Name	Demographic Index Score	Environmental Hazard Index Score	Environmental Opportunity Index Score	Combined Equity Index Score
Green River	54.8	60.2	84.4	66.4
Mill Creek	59.8	69.0	86.5	71.7
Mullen Slough	51.3	62.3	81.3	64.9
Olsen Creek	48.5	53.4	72.2	58.0
Soosette and Big Soos Creeks	48.8	51.9	80.9	60.5
White River	45.8	56.5	78.3	60.2



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4. STORMWATER MANAGEMENT INFLUENCE (STEP 3)

The previous sections delineated the affected receiving waters in the City and provided key aspects regarding existing conditions of the waters. This section addresses some of the potential watershed actions and factors that could influence those receiving water conditions and begins to outline some of the measures and approaches that can be applied to address or minimize those watershed influences.

Three questions are considered in this section.

1. What are the major flow or pollutant impacts expected to be contributed by each basin in the City, and how might they be expected to change?
2. Are there approaches, other than direct stormwater treatment or controls, that could serve to limit impacts?
3. Can growth be managed to minimize adverse stormwater impacts?

The following sections provide a discussion of approaches that can be considered in the SMAP to evaluate and address existing conditions and potential measures to be considered to control the activities most responsible for receiving water degradation.

4.1.1 Stormwater Management Influence

Development and activities in the watershed result in changes to basin hydrology and addition of pollutants to stormwater runoff. The relative intensity of impervious surfaces and pollution-generating activities generally have commensurate relative impacts found in the receiving waters. As part of the SMAP process, the City has begun to evaluate key factors that characterize the potential magnitude of these watershed influences, which can lead to directing actions to those areas that need it the most. Conversely, an assessment of watersheds that have lower potential watershed impacts can demonstrate the magnitude to which land use decisions and growth management actions can be applied to protect receiving waters that still exhibit positive characteristics.

The City has reviewed the stormwater management influence of each receiving water subbasin, considering both hydrologic impact and potential pollutant loadings—qualitatively estimated based on existing land cover shown in Figure 4—as described in the Stormwater Management Action Planning Guidance (Ecology 2019). This evaluation is summarized in Table 8 below.

Table 8. Receiving Water Influence

Consideration	City Condition	Include Subbasin in Prioritization Analysis?
Hydrologic (Flow) Impact – Is basin runoff associated only with:		
Flow-control exempt receiving waters	Some, but will be included in assessment	Yes
Ephemeral streams	None. All subbasins have been delineated based on associated perennial streams, rivers, or lakes, or marine waters	Yes
Receiving waters primarily influenced by groundwater flows	None	Yes
Pollutant Load (Water Quality Impact) – Is basin runoff generated only from:		
Non-pollutant generating surfaces?	No subbasins meet this threshold	Yes
Low-density residential land uses?	No subbasins meet this threshold	Yes
Parking areas with up to 100 total trip ends or for up to 300 employees?	No subbasins meet this threshold	Yes

Table 8. Receiving Water Influence (continued)

Consideration	City Condition	Include Subbasin in Prioritization Analysis?
Roads with ADT up to 7,500; limited access highways with ADT up to 15,000?	Some subbasins may meet this threshold, but the City will include in prioritization process	Yes
Other land uses where runoff is already being fully treated to current standards?	No subbasins meet this threshold	Yes

The PSWCM also includes information on the hydrologic and pollutant loading impacts discussed in Section 3.3.3 and in Appendix B. Those results are summarized in Table 9. The hydrologic impact values were derived from the water flow importance layer sub-model, while the pollutant loading impact values were calculated by combining the values from the sediment loading, phosphorus, nitrogen, and heavy metal export potential sub-model within the city limits. In general, a basin with a high hydrologic impact is indicative of a basin with greater potential importance to the movement of water based on physical attributes of the landscape. Similarly, a basin with a high pollutant loading impact is indicative of a basin expected to have a higher potential for the generation and export of pollutants to areas downstream. Further information regarding the sub-models can be found in Appendix B.

Table 9. Receiving Water Influence from PSWCM

Basin Name	Hydrologic Impacts	Pollutant Loading Impacts
Green River	Moderate High	Moderate High
Mill Creek	Moderate High	Moderate
Mullen Slough	High	Low
Olsen Creek	Moderate High	Moderate High
Soosette and Big Soos Creeks	Moderate	Moderate High
White River	Moderate High	Moderate

Note: Scoring is based on a number scale from 1 (Low) to 4 (High). More information on scoring is given in Appendix B.

Based on the criteria from Ecology and the information from the PSWCM, the City has not excluded any receiving water basins. Furthermore, these results are not a prioritization, but rather a relative comparison of basins that can be applied to the ranking and prioritization process that will be developed in future SMAP development. This report focused on the overall receiving waters- specific sources for flow impacts and pollutants will be addressed in future SMAP processes. Measures to control these existing and on-going watershed impacts will also be developed in future SMAP process after drainage area prioritization to provide a targeted approach to the selected basin.

4.1.2 Other Approaches to Limit Impacts

The watershed analyses described in previous sections provide some insight into the accumulated potential for impacts due to watershed development and activities. Non-treatment alternatives include, but are not limited to, the following:

- Reduced development – downzoning property.
- Reduced development footprint and infilling – reducing impervious area requirements; “building up” to provide same livable area with smaller ground footprint; infilling to use existing infrastructure and regional treatment.
- Road diets and increased and incentivized transit.
- Further limiting encroachment into riparian critical areas.

- Behavior changes and education.
- Product replacement to reduce pollutant sources.
- Source control management, inspections, and enforcement.

While policy decisions developed in the SMAP will include recommendations and measures to reduce future impacts via land use strategies, other potential measures listed are generally beyond the scope of the SMAP or are already addressed in the ongoing stormwater management programs being implemented by the City and other Phase I and II communities under the Permit.

4.1.3 Growth Management Strategies

Washington communities, under the Growth Management Act, are required to prepare plans to address and accommodate expected growth into appropriate areas. These strategies, as related to stormwater, are expected to consider the potential impacts of growth on the receiving waters and recommend strategies to address these potential impacts. The final SMAP will include policy measures to potentially inform growth management planning and strategies.

Growth and new development are the key factors that require controls and measures to manage stormwater and limit receiving water impacts, and accommodating expected growth is a key consideration for growth management planning. Consequently, there is a direct potential conflict between the objectives of growth management (new development, infill, redevelopment) and non-treatment stormwater control strategies. The following are a list of non-treatment stormwater control strategies that may be considered in the prioritization and the final SMAP:

- Modifying growth center locations and shapes to match drainage basin boundaries.
- Directing infill and redevelopment to areas with existing infrastructure.
- Directing new development, infill, and redevelopment to areas with preferred conditions for infiltration.
- Using existing regional stormwater facilities or expansion and constructing new regional facilities (this strategy has a treatment component).
- Initiating and implementing basin transfer programs in redevelopment zones.
- Developing transit plans and road diets to reduce roadway impacts.
- Establishing mitigation banks for riparian zone protection and restoration.

The prioritization process and final SMAP will include steps to consider future development potential and the influence of redevelopment or infill strategies.

5. RELATIVE CONDITIONS AND CONTRIBUTIONS (STEP 4)

This step is intended to narrow the number of receiving waters and subbasins beyond any that were eliminated in Step 3 above to a candidate list for inclusion in the Receiving Water Prioritization process. To support this evaluation, the City has considered the Ecology SMAP Guide (Ecology 2019), the PSWCM (Ecology 2016a), and Building Cities in the Rain – Watershed Prioritization for Stormwater Retrofit (Commerce 2016). These guides and studies look at two overlapping factors for subbasin evaluation: current condition and level of influence on the receiving water. Of these two factors, the level of influence on the receiving water generally has a higher importance for initial action, whether the condition of the subbasin warrants either protection (of an excellent current condition) or restoration (of a degraded current condition).

This Receiving Water Assessment has summarized known conditions of the waters at selected locations and reaches. These outcomes can reflect waters that are impaired and need restoration or exhibit good conditions where protection is warranted. It can also reflect a lack of data or an unknown condition. In the basin planning process, questions are often posed as to whether protection or restoration is a higher priority or more urgent and how to choose the condition category to which the drainage analysis unit belongs. The approach chosen in this Receiving Water Assessment is to assume that all existing degraded watersheds (or any subunit contained therein) or receiving water could benefit from restoration and all basins, degraded or not, are subject to potential beneficial improvements. Also, existing stormwater controls for new development and redevelopment are AKART (all known, available, and reasonable methods of prevention, control, and treatment) and can reasonably be considered an effective protection approach, thus future potential development threats have been addressed. It could be argued that a basin close to a "tipping point" from not degraded to degraded could be a targeted basin for improvement. This consideration will be evaluated in the next prioritization step during the SAMP process as an important interpretation of the findings of the basin drainage analysis unit characterization. In addition, the City is not in a position at this time to make this policy decision that could be interpreted as conflicting with state policy and regulations on degraded systems. Therefore, all receiving water subbasins will be included in the SMAP prioritization process moving forward. The specific condition of each subbasin—warranting the range of actions from protection to restoration—will be assessed during the Receiving Water Prioritization based on the information summarized in this Receiving Water Assessment.

The data collected and summarized in the report are intended to provide a general characterization of what is known about each of the receiving waters in the City, provide an assessment of available watershed characteristics (in the PSWCM) that can influence runoff to those waters, and summarize other data to characterize other social factors that may influence the prioritization decisions to be made in the SMAP. This step is not intended to analyze data about specific catchment areas or drainage analysis units, make comparisons, prioritize, or apply other subjective criteria about targeted stormwater investments in the selected map basin. These analyses will be completed in the Receiving Water Prioritization report when the basin data can be properly evaluated, scored, and assessed for basin-specific comparative data. Consequently, the two data sets used to assess the basins in this step in the SMAP process are the summary water quality metrics that were considered from Section 3.2 related to each watershed in the City and the PSWCM summary results considered in Section 3.3.3. The summary of both is shown in Table 10. It may be anticipated that the preferred SMAP drainage analysis unit could be in one of the basins that scored as having the greatest need and would be a possible preferred target for additional stormwater investments.

The catchment area data collected and reviewed in the report were used as a basis for developing the preliminary drainage analysis units for the prioritization analysis (Figure 8). The analysis units were created by overlaying the receiving water basins on an existing drainage basin layer within the city. Then the drainage basins were grouped based on topography and storm system pipes to produce appropriately sized basins for the SMAP analysis (around 1 square mile). Data regarding key runoff and stormwater management characteristics for each basin will be processed in a spreadsheet model to score basin existing conditions (stormwater influences such as land cover and impervious surfaces), show existing stormwater controls (potentially mitigating those existing impacts) and consider future development potential. After this screening analysis, a series of overlays are proposed. The first group are other key factors, such as environmental justice and other social considerations (Section 3.4) as well as existing receiving water condition (Section 3.3). The next group will consider subjective overlays and include items such as preferred basins that meet other planning objectives. The capital improvement plan for the City will be reviewed for other key projects that may influence coordinated project planning. Additional plans that will be reviewed include but are not limited to: the stormwater comprehensive plan; growth centers or redevelopment strategies identified in the growth management plan; transit plans and significant roadway upgrades; known large-scale redevelopment or infill plans; and park and open space plans.

6. RESULTS

Results of the City's SMAP Receiving Water Assessment are summarized in Table 10.

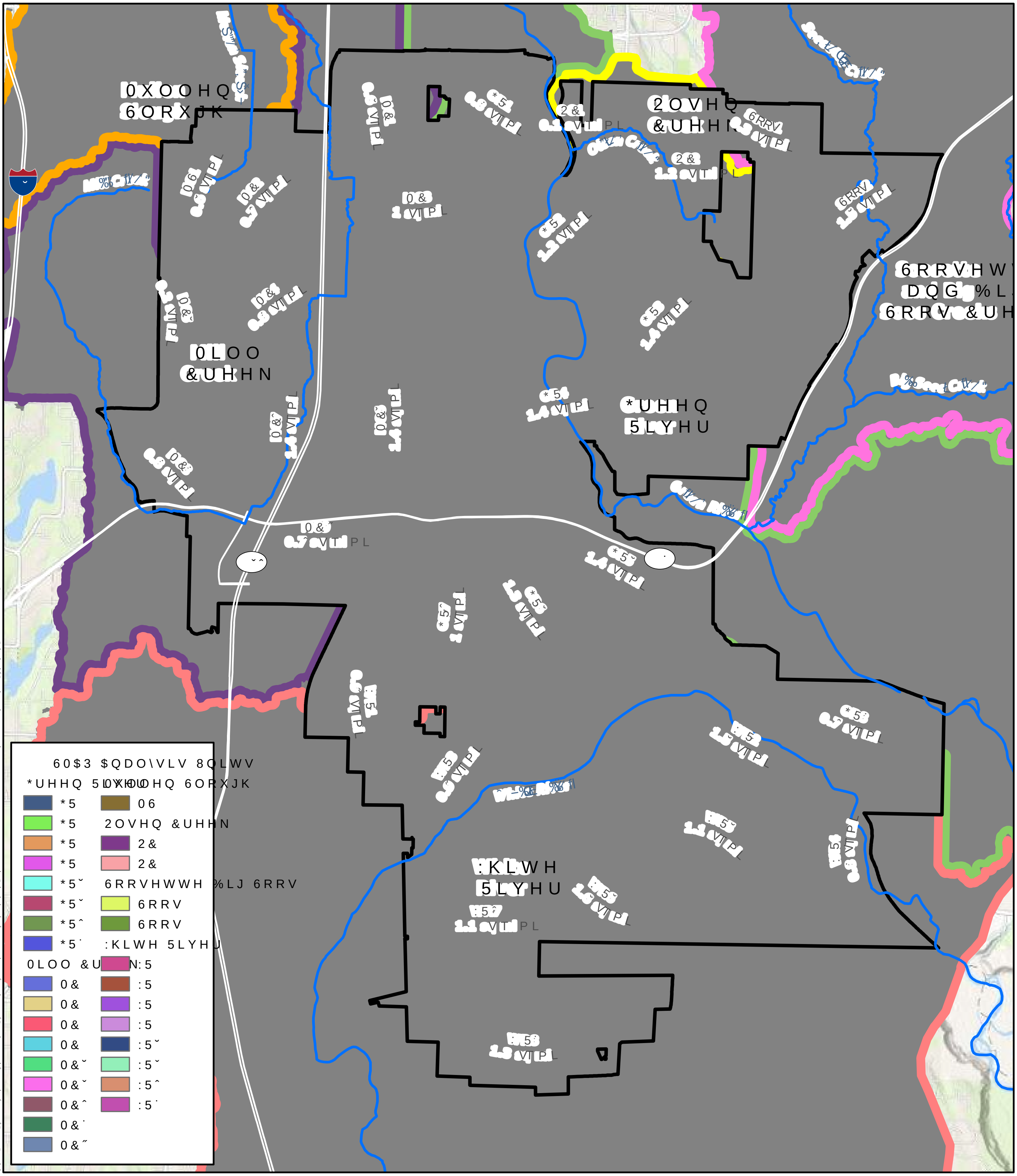

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Table 10. SMAP Drainage Basin Inventory

Receiving Water Basin	Total Drainage Basin Area (square miles)	Percent of Total Drainage Basin Area Within the City (%)	Relative Water Quality Condition of Receiving Water					Combined Equity Index Score	Included in Prioritization? Yes/No
			Water Quality Data Points in Basin						
			WQI Rating[a]	303(d) Listings/TMDL	Benthic Index of Biotic Integrity		Puget Sound Watershed Characterization Model Score[b] within the City		
					Stream Name (Site ID)	Biological Condition (Overall Score)			
Green River	18.1	51.1%	Good (81)	Bioassessment (B-IBI)	Green River (1976)	Poor (36.7)	11.70	58.0	Yes
				Dissolved Oxygen	Green River (1004)	Very Poor (12.3)			
				Green River Temperature Watershed TMDL (2011)	Green River – Lower tributary 0069 (240)	Very Poor (15.6)			
Mill Creek	13.0	58.5%	Moderate (48)	Bacteria (*Fecal coliform)*	Mill Creek (250)	Fair (50.2)	10.27	60.5	Yes
				Bioassessment (B-IBI)	Mill Creek (251)	Fair (44.9)			
				Dissolved Oxygen	Mill Creek (252)	Fair (52)			
				pH	Mill Creek (253)	Very Poor (0.3)			
				Green River Temperature Watershed TMDL (2011)	Mill Creek (325)	Fair (50.5)			
					Mill Creek (326)	Very Poor (9.9)			
					Mill Creek (324)	Fair (52.5)			
Mullen Slough	5.5	10.8%	No data	Bacteria (*Fecal coliform)*	Bingamon Creek (312)	Poor (27.9)	10.17	66.4	Yes
				Bioassessment (B-IBI)	Mullen Slough (238)	Very Poor (7)			
				Green River Temperature Watershed TMDL (2011)					
Olsen Creek	1.7	75.4%	No data	Bioassessment (B-IBI)	Olson Creek (239)	Excellent (82.5)	10.00	71.7	Yes
				Green River Temperature Watershed TMDL (2011)					
Soosette and Big Soos Creeks	27.5	6.7%	Good (85)	Bacteria (Fecal coliform)	Big Soos Creek (262)	Good (69.8)	11.84	64.9	Yes
				Bioassessment (B-IBI)	Soos Creek (267)	Fair (48.8)			
				Dissolved Oxygen	Soos Creek (1977)	Fair (48.9)			
				Temperature	Soos Creek (1997)	Fair (48.8)			
				Soos Creek Watershed Fecal Coliform TMDL (In development)	Soos Creek (1617)	Excellent (82.3)			
				Soos Creek Multiparameter TMDL (In development)	Soosette Creek (263)	Good (64.3)			
					Soosette Creek (264)	Good (63.6)			
					Soosette Creek (1932)	Good (72.3)			
					Soosette Creek (1933)	Good (69.4)			
White River	38.7	9.3	Moderate (63)	Dissolved Oxygen	No data		10.05	60.2	Yes
				pH					
				Temperature					
				Instream Flow					
				Lower White River pH TMDL (In development)					
				Puyallup River Bacteria TMDL (2011)					

Sources: WQI Rating – King County 2020; 303(d) Listings/TMDL – Ecology 2018; Benthic Index of Biotic Integrity – King County 2015; PSWCM Score – Ecology 2016a and 2016b; Combined Equity Index Score – EPA 2019.

[a] WQI scores and status: **poor** (40 and below) – does not meet expectations, highest concern; **moderate** (40 to 80) – of moderate concern; **good** (80 and above) – meets expectations, lowest concern (King County 2020). **N/A** means that the WQI is not applicable to this receiving water. The WQI was developed to score water quality for streams and rivers using stream monitoring gauge data.

[b] Scoring summations would be translated to quartiles as follows: High – 16; Moderate - high -12; Moderate– 8; and Low - 4

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Appendix A

Water Quality Assessment

DESIGNATED USES & WATER QUALITY CONDITION THRESHOLDS

The Department of Ecology has defined four groups of designated uses for surface water within the state of Washington: Aquatic Life Uses, Recreational Uses, Water Supply Uses, and Miscellaneous Uses. Water quality criteria has been identified, and thresholds for the relative condition of Washington's water bodies have been set for each designated use. Table A-1 below defines the designated uses, and Table A-2 describes the applicable thresholds for Washington's surface waters per WAC 173-201A-200.

The state of Washington has been divided into 62 watersheds, otherwise known as Water Resource Inventory Areas (WRIA). The Department of Ecology uses WRIAs to regulate water bodies. Table 602 in WAC 173-201A-600 lists specific water bodies organized by WRIA along with their assigned designated uses (Table A-3). The City of Auburn boundaries are within the Duwamish-Green watershed (WRIA 9) and the Puyallup-White watershed (WRIA 10). The receiving waters for the City of Auburn listed in Table 602 include the Green River in WRIA 9 and the White River in WRIA 10.

Per Ecology publication 06-10-038, there are waters within Auburn City limits that would require supplemental spawning and incubation protection for salmonid species (Ecology 2011). Figures A-1 and A-2 show the location of waters in WRIA 9 and WRIA 10, respectively, with supplemental spawning and incubation criteria. Per WAC 173-201A-200 (1)(c)(iv), the waters identified in Ecology publication 06-10-038 are required to apply the following criteria to protect the reproduction of native char, salmon, and trout:

- Maximum 7-DADMax temperatures of 9°C (48.2°F) at the initiation of spawning and at fry emergence for char; and
- Maximum 7-DADMax temperatures of 13°C (55.4°F) at the initiation of spawning for salmon and at fry emergence for salmon and trout.

Table A-1. Designated Use Definitions

Designated Use	Definition
Aquatic Life	Designated based on the presence of or to provide protection for salmonid and char spawning and rearing, salmonid migration, core summer salmonid habitat, non-anadromous interior redband trout, and indigenous aquatic species. Waters with designated uses in this category have criteria standards for toxic, radioactive, and deleterious materials; aesthetic values; temperature; dissolved oxygen; total dissolved gas; and pH.
Recreational	Designation for waters used as a means of primary contact recreation, where a person would have direct contact with water to the point of complete submergence, including skin diving, swimming, water skiing, etc. Waters with designated uses in this category have criteria standards for toxic, radioactive, and deleterious materials; aesthetic values; and bacteria (*E. coli*).
Water Supply	Designation for waters used for domestic, agricultural, and/or industrial water supply, and stock watering purposes. Waters with designated uses in this category have criteria standards for toxic, radioactive, and deleterious materials as well as aesthetic values.
Miscellaneous	Designation for waters used as the following: wildlife habitat (those waters that provide food support to aquatic life and wildlife at any life stage or activity); fish harvesting; commerce and navigation; boating; and aesthetics. Waters with designated uses in this category have criteria standards for toxic, radioactive, and deleterious materials as well as aesthetic values.

Source: WAC 172-201A-200

Table A-2. Designated Uses and Standards for Washington Water Bodies per WAC 173-201A-200

Use Designation	Use General Description	Use Standards (see WAC 173-201A-200)				
Aquatic Life Uses:	**(see WAC 173-201A-200[1])**	**Highest 7-DADMax**	**DO**	**Turbidity**	**Total Dissolved Gas**	**pH**
Char Spawning/Rearing	Char spawning and rearing. The key identifying characteristics of this use are spawning or early juvenile rearing by native char (bull trout and Dolly Varden) or use by other aquatic species similarly dependent on such cold water. Other common characteristic aquatic life uses for waters in this category include summer foraging and migration of native char and spawning, rearing, and migration by other salmonid species.	12°C (53.6°F)	9.5 mg/L	Shall not exceed: • 5 NTU over background when the background is 50 NTU or less; or • A 10% increase in turbidity when the background turbidity is more than 50 NTU.	Total dissolved gas shall not exceed 110% of saturation at any point of sample collection.	pH shall be within the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.2 units.
Core Summer Habitat	Core summer salmonid habitat. The key identifying characteristics of this use are summer (June 15–September 15) salmonid spawning or emergence, or adult holding; use as important summer rearing habitat by one or more salmonids; or foraging by adult and subadult native char. Other common characteristic aquatic life uses for waters in this category include spawning outside of the summer season, rearing, and migration by salmonids.	16°C (60.8°F)	9.5 mg/L	Same as above.	Same as above.	Same as above.
Spawning/Rearing	Salmonid spawning, rearing, and migration. The key identifying characteristic of this use is salmon or trout spawning and emergence that only occurs outside of the summer season (September 16–June 14). Other common characteristic aquatic life uses for waters in this category include rearing and migration by salmonids.	17.5°C (63.5°F)	8.0 mg/L	Same as above.	Same as above.	pH shall be within the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.5 units.
Rearing/Migration Only	Salmonid rearing and migration only. The key identifying characteristic of this use is use only for rearing or migration by salmonids (not used for spawning).	17.5°C (63.5°F)	6.5 mg/L	Shall not exceed: • 10 NTU over background when the background is 50 NTU or less; or • A 20% increase in turbidity when the background turbidity is more than 50 NTU.	Same as above.	Same as above.
Redband Trout	Non-anadromous interior redband trout. For the protection of waters where the only trout species is a non-anadromous form of self-reproducing interior redband trout (*O. mykiss*) and other associated aquatic life are present.	17.5°C (63.5°F)	8.0 mg/L	Shall not exceed: • 5 NTU over background when the background is 50 NTU or less; or • A 10% increase in turbidity when the background turbidity is more than 50 NTU.	Same as above.	Same as above.
Warm Water Species	Indigenous warm water species. For the protection of waters where the dominant species under natural conditions would be temperature tolerant indigenous nonsalmonid species. Examples include dace, redside shiner, chiselmouth, sucker, and northern pikeminnow.	17.5°C (63.5°F)	6.5 mg/L	Shall not exceed: • 10 NTU over background when the background is 50 NTU or less; or • A 20% increase in turbidity when the background turbidity is more than 50 NTU.	Same as above.	Same as above.
Recreational Uses:	**(see WAC 173-201A-200[2])**	**Bacteria Criteria--*E. coli***				
Primary Contact	Primary contact recreation.	*E. coli* organism levels within an averaging period must not exceed a geometric mean value of 100 CFU or MPN per 100 mL, with not more than 10% of all samples (or any single sample when less than ten sample points exist) obtained within the averaging period exceeding 320 CFU or MPN per 100 mL.				
Water Supply Uses:	**(see WAC 173-201A-200[3])**	**Toxic, Radioactive, and Deleterious Materials and Aesthetic Values[a]**				
Domestic Water	Domestic water supply.	General criteria that apply to water supply uses are described in WAC 173-201A-260 (2)(a) and (b) and are for toxic, radioactive, and deleterious materials as well as aesthetic values. A list of toxic and radioactive substances as well as associated thresholds can be found in WAC 173-201A-240, Toxic substances, and WAC 173-201A-250, Radioactive substances.				
Industrial Water	Industrial water supply.					
Agricultural Water	Agricultural water supply.					
Stock Water	Stock watering.					
Miscellaneous Uses:	**(see WAC 173-201A-200[4])**	**Toxic, Radioactive, and Deleterious Materials and Aesthetic Values**				
Wildlife Habitat	Wildlife habitat.	General criteria that apply to miscellaneous freshwater uses are described in WAC 173-201A-260 (2)(a) and (b) and are for toxic, radioactive, and deleterious materials as well as aesthetic values. A list of toxic and radioactive substances as well as associated thresholds can be found in WAC 173-201A-240, Toxic substances, and WAC 173-201A-250, Radioactive substances.				
Harvesting	Fish harvesting.					
Commerce/Navigation	Commerce and navigation.					
Boating	Boating.					
Aesthetics	Aesthetic values.					

Notes: CFU = colony forming units; DO = dissolved oxygen; mg/L = milligrams per liter; mL = milliliter; MPN = most probable number; NTU = nephelometric turbidity units

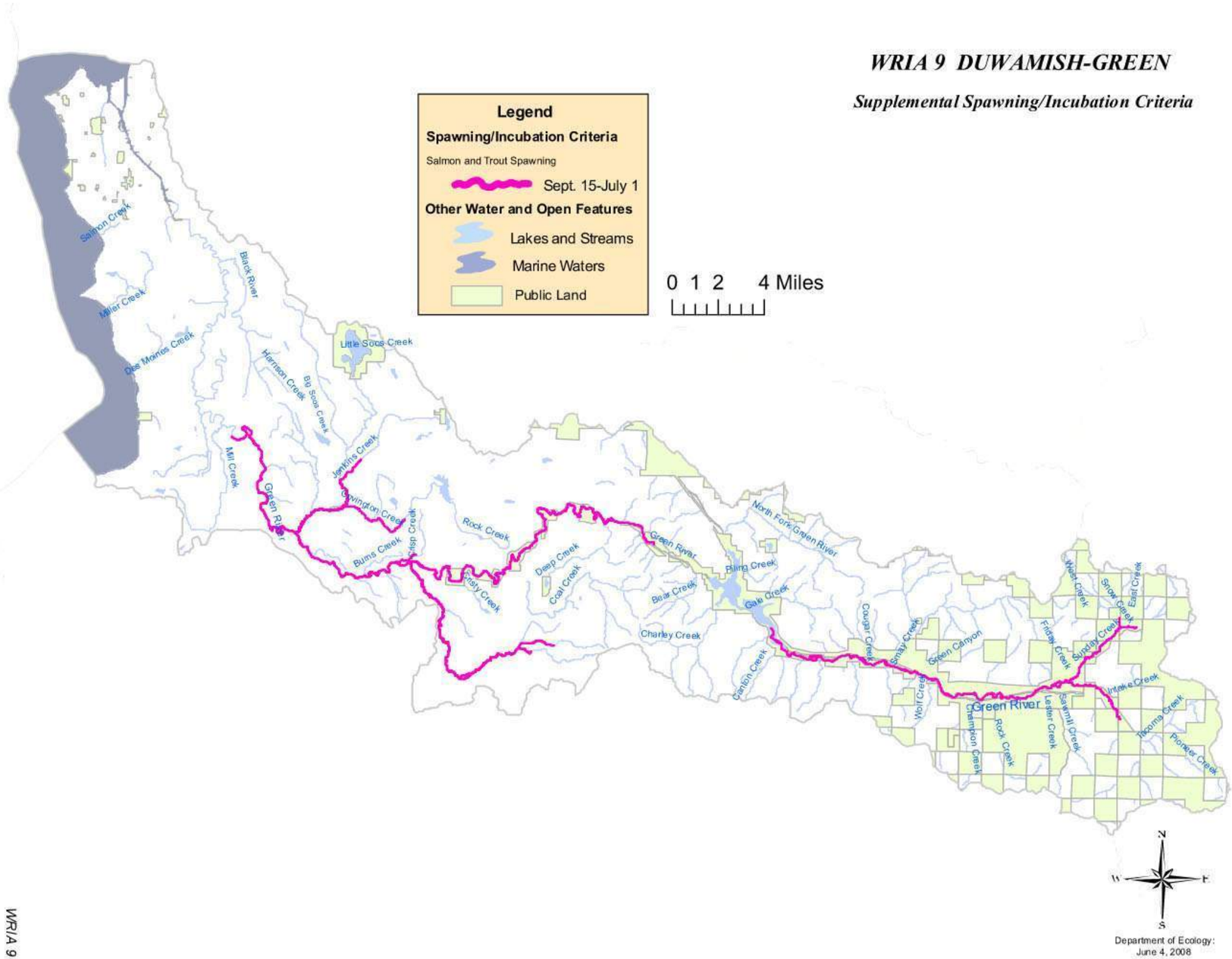
[a] Toxic, radioactive, and deleterious materials and aesthetic values listed also apply for all Aquatic Life and Recreational Uses.

Table A-3. Designated Uses for Auburn Receiving Waters

WRIA Number	WRIA Name	Receiving Water	Table 602 Location Information	Aquatic Life Uses	Recreation Uses	Water Supply Uses	Misc. Uses	Additional Info for Waterbody
9[a]	Duwamish-Green	Green River	From and including the Black River (latitude 47.4737, longitude -122.2521, and point where Duwamish River continues as the Green River) to latitude 47.3699, longitude -122.246, above confluence with Mill Creek.	Spawning/Rearing	Primary Contact	All	All	173-201A-200 (1)(c)(iv)
			Upstream from above confluence with Mill Creek at latitude 47.3699, longitude -122.2461 (east of the West Valley highway) to west boundary of Flaming Geyser State Park, including tributaries.	Core Summer Habitat	Primary Contact	All	All	173-201A-200 (1)(c)(iv)
10[a]	Puyallup-White	White River	Upstream from the mouth (latitude 47.2001, longitude -122.2585) to latitude 47.2438, longitude -122.2422.	Spawning/Rearing	Primary Contact	All	All	-
			Upstream from latitude 47.2438, longitude -122.2422 to Mud Mountain dam (latitude 47.1425, longitude -121.931), including tributaries.	Core Summer Habitat	Primary Contact	All	All	173-201A-200 (1)(c)(iv)
N/A	N/A	All surface waters not named in Table 602	N/A	Spawning/Rearing or Core Summer Habitat[c]	All	All	All	173-201A-600 (1)

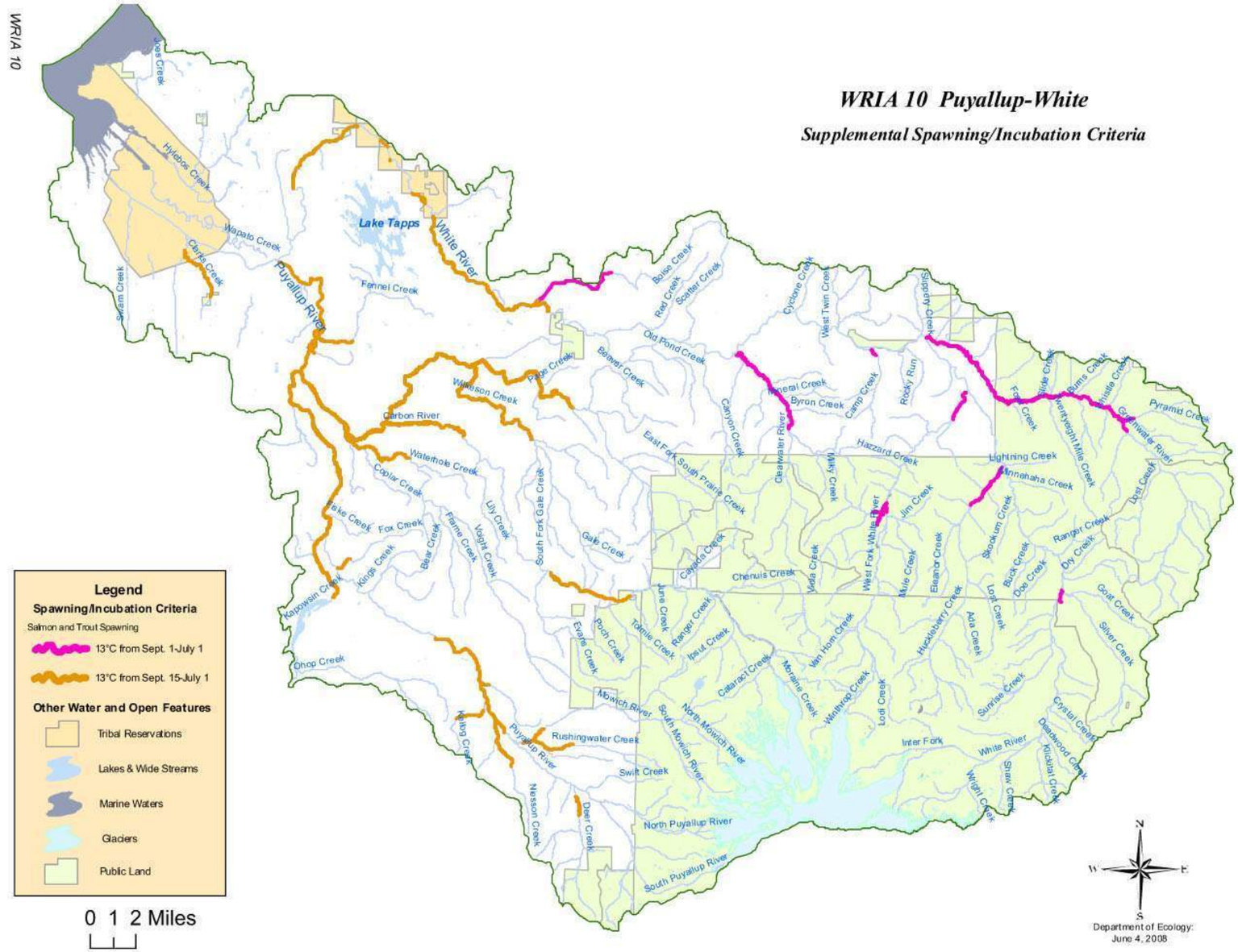
[a] This WRIA contains waters requiring supplemental spawning and incubation protection for salmonid species per WAC 173-201A-200 (1)(c)(iv). See Ecology 2011 for further information.

[b] Per WAC 173-201A-600 (1)(a), all waters not in Table 602 will be protected for the salmonid spawning, rearing, and migration designated uses. Additionally, the following waters are also to be protected for core summer habitat: all surface waters in national parks, national forests, and/or wilderness areas; all lakes and all feeder streams to lakes; all surface waters that are tributaries to waters designated core summer salmonid habitat; all fresh surface waters that are tributaries to extraordinary aquatic life marine waters.



Source: Ecology 2011

Figure A-1. Waters in WRIA 9 with Supplemental Spawning/Incubation Criteria (per Ecology 2011).



Source: Ecology 2011

Figure A-2. Waters in WRIA 10 with Supplemental Spawning/Incubation Criteria (per Ecology 2011)

WATER QUALITY INDEX

The Water Quality Index (WQI) attempts to integrate a series of key water quality parameters into a single number that can be used to compare different sampling locations over time. Originally, the WQI was developed by the Environmental Protection Agency (EPA) Region 10 and was based on curves that relate concentrations or measurements of eight constituents to index scores and then aggregates scores into a single number. The EPA curves were a synthesis of national criteria, state standards, and technical guidelines. Ecology adapted this index for use in Washington State by adjusting the curves to reflect local water quality standards and/or guidelines. In 2009, Ecology modified the WQI to reflect revised state water quality rules for the protection of native fish and aquatic resources reflected in supplemental temperature criteria for many of the Puget Sound basins. In addition to modifications for revised state criteria, the WQI was further modified in 2009 by Ecology to reflect conditions more directly in Puget Sound lowland streams. King County is using Ecology's Puget Sound lowland stream version of the WQI. For purposes of year-to-year comparison, results from previous years were recalculated using the new Puget Sound Lowland Stream WQI (King County 2020).

The White River did not have a WQI station and was calculated using Ecology's WQI spreadsheet for the station 10C095 for the most recent water year with sufficient data availability (2008). The results from the spreadsheet calculation have been included in Attachment A1.

Table A-4. Water Quality Index (WQI) Scoring and Status Index

WQI Score	Status
80 and above	Good – meets expectations – lowest concern
40 to 80	Moderate – of moderate concern
40 and below	Poor – does not meet expectations – highest concern

Source: Ecology 2002

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Attachment A1

King County DNRP Water Quality Index

White River Water Quality Index Spreadsheet Results

King County DNRP Water Quality Index

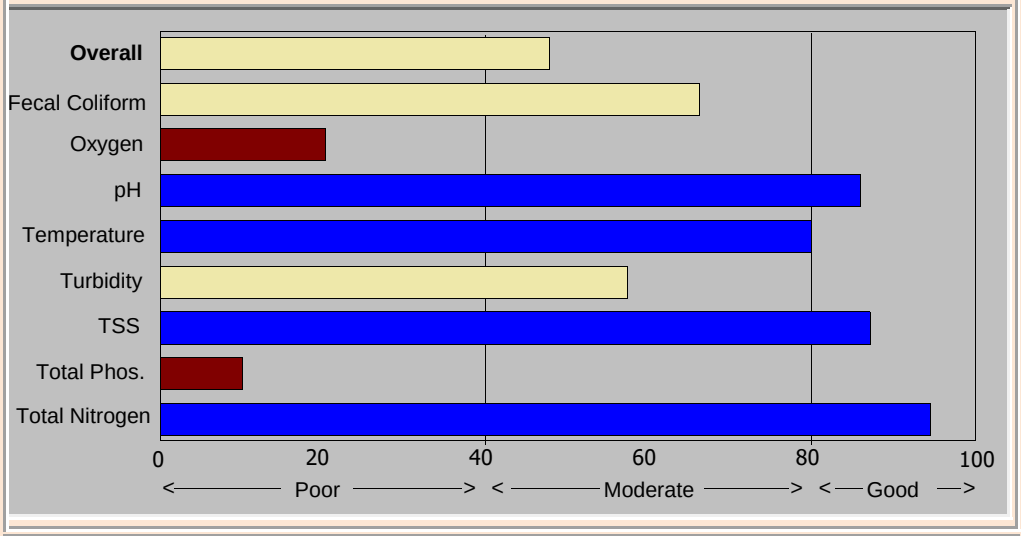
STATION A315 WATER YEAR 2020

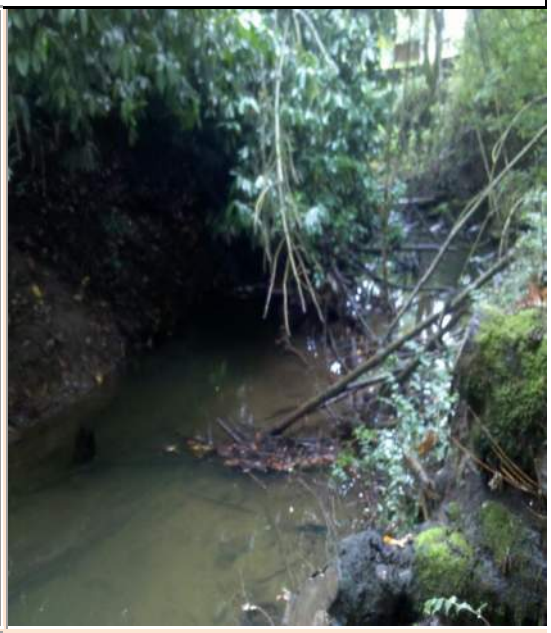
GAUGE # 41a **Mill Creek at SR 181** **Overall Index** 48

King County monitors water quality in Mill Creek at station A315, which is located at the bridge at 68th Ave and South 261st Street. Monitoring at this site began in 1979 and continued until 2008 when budget cutbacks forced King County to reduce its water quality monitoring program. Regular monitoring resumed in February 2013. The Mill Creek basin encompasses 14,000 acres, which includes portions of Kent, Auburn, Algona, and Federal Way. Land use in the Mill Creek watershed consists of forested and residential land in the upper basin, and residential and agricultural in the lower basin. Mill Creek originates from Lake Doloff and Lake Geneva and flows 8.35 miles before entering the Green River. The creek is on Ecology's 2012 303(d) list for violation of temperature, dissolved oxygen, fecal coliform bacteria, and copper standards. Coho, chum and winter steelhead have been observed spawning in Mill Creek, and juvenile coho, chum, winter steelhead, cutthroat and chinook have been observed in the creek.

Annual Water Quality Index Scores

Water quality was MODERATE based on data collected 10/1/2019 to 9/30/2020.

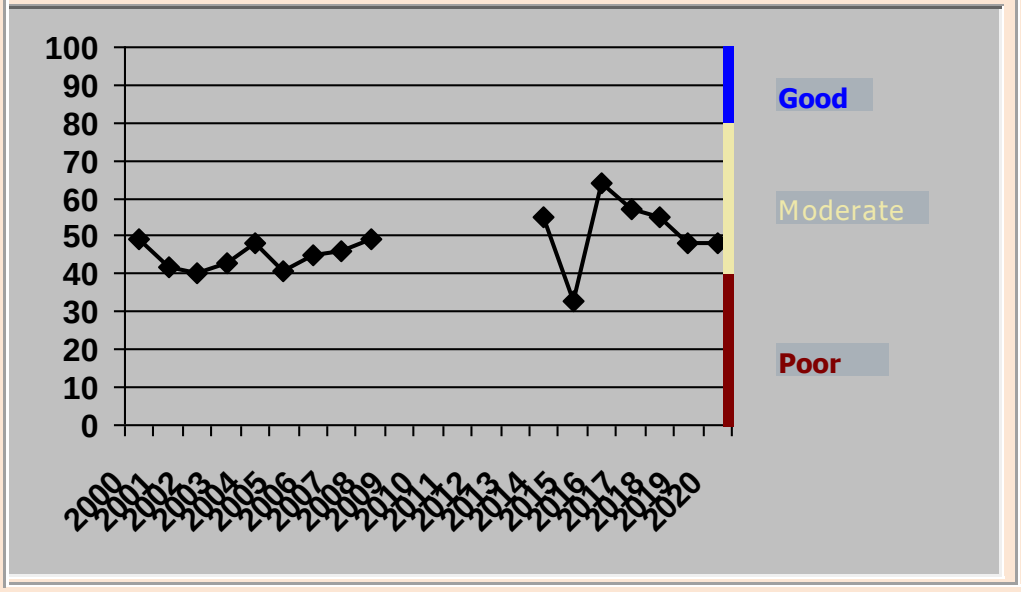




Monthly Scores For Water Year 2020

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
66	86	94	90	83	91		61	62	61	21	69

WQI Score Comparison By Water Year



For more information about this creek please visit our website at http://green.kingcounty.gov/WLR/Waterres/StreamsData/streamlist.aspx

About The Water Quality Index:

The Water Quality Index (WQI) score is a unit-less number ranging from 10 to 100: the higher the number, the higher the water quality. Scores are calculated from data collected during the monthly routine sampling. For temperature, pH, fecal coliform bacteria, turbidity, and dissolved oxygen, the index expresses results relative to levels required to maintain beneficial uses according to criteria in Washington's Water Quality Standards, WAC 173-201A. For nutrient and sediment measures where there are no standard, results are expressed relative to guidelines for this eco-region. Results from the eight parameters are aggregated over time to produce a single score for each sample station. In general, stations scoring 80 and above did not fail water quality standards or guidelines and are of "low concern", scores 40 to 80 indicate "moderate concern", and water quality at stations with scores below 40 are of "high concern". For more information about the WQI please visit https://green2.kingcounty.gov/streamsdata/WQI.aspx

King County DNRP Water Quality Index

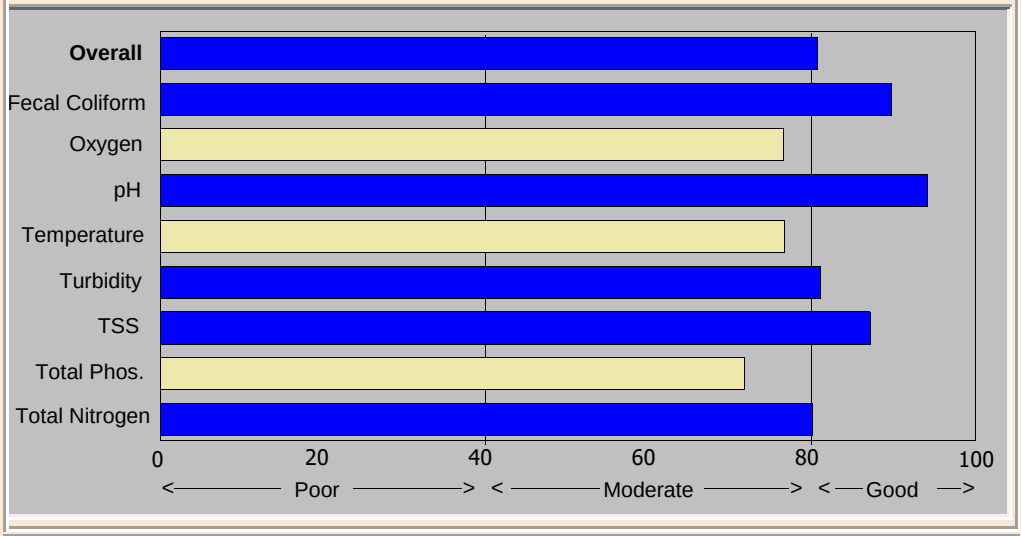
STATION A319 WATER YEAR 2020

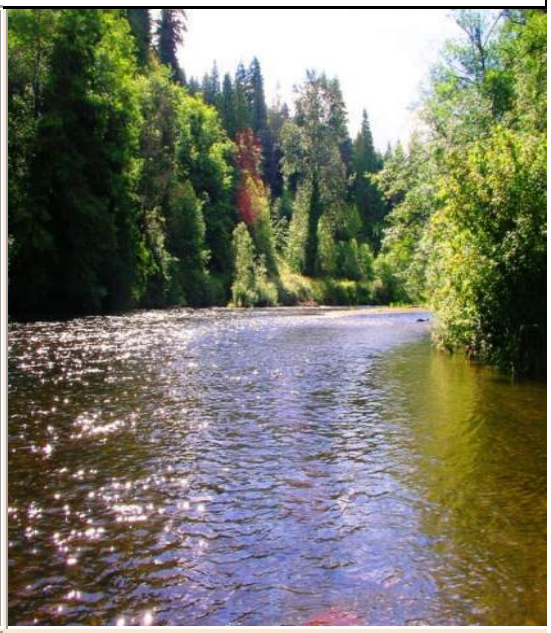
GAUGE # 40F **Green River above Soos Creek** Overall Index **81**

King County has monitored water quality in the Green-Duwamish River at five locations. Station A319 is located upstream of the confluence of Soos Creek at the bridge on Black Diamond Road. Sampling began in 1976 but was discontinued between 2008 and 2014 when budget cutbacks reduced the breadth of King County's water quality monitoring program. The Green-Duwamish runs 93 miles from the crest of the Cascade Mountains to Elliot Bay. The Green-Duwamish River is on the Washington State Department of Ecology's 303(d) list, Category 5, for violations of the dissolved oxygen standards, and Category 4a for temperature violations.

Annual Water Quality Index Scores

Water quality was GOOD based on data collected 10/1/2019 to 9/30/2020.

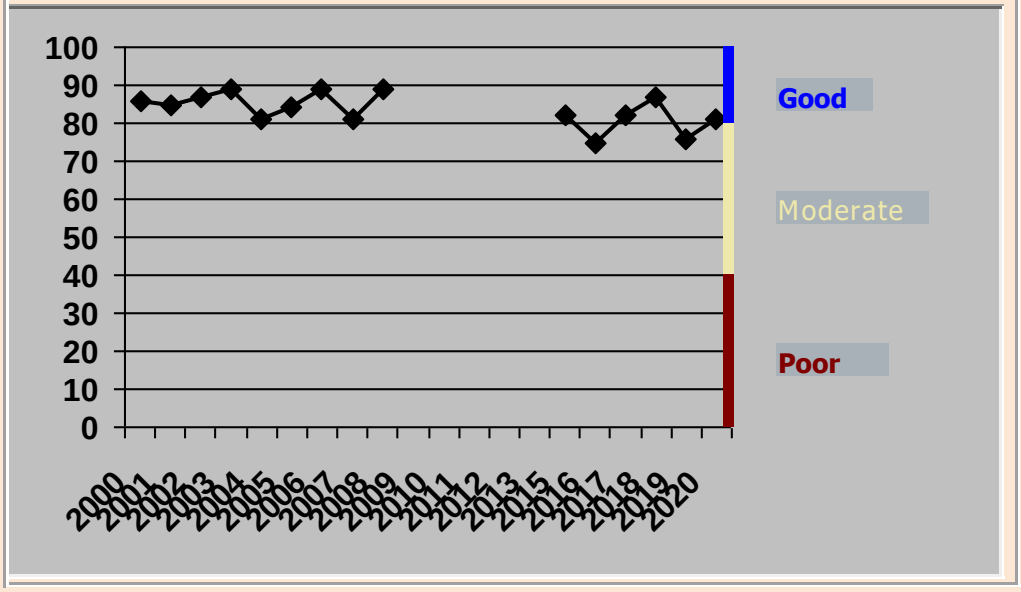




Monthly Scores For Water Year 2020

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
75	96	97	97	82	97		92	91	92	87	84

WQI Score Comparison By Water Year



About The Water Quality Index:

The Water Quality Index (WQI) score is a unit-less number ranging from 10 to 100: the higher the number, the higher the water quality. Scores are calculated from data collected during the monthly routine sampling. For temperature, pH, fecal coliform bacteria, turbidity, and dissolved oxygen, the index expresses results relative to levels required to maintain beneficial uses according to criteria in Washington's Water Quality Standards, WAC 173-201A. For nutrient and sediment measures where there are no standard, results are expressed relative to guidelines for this eco-region. Results from the eight parameters are aggregated over time to produce a single score for each sample station. In general, stations scoring 80 and above did not fail water quality standards or guidelines and are of "low concern", scores 40 to 80 indicate "moderate concern", and water quality at stations with scores below 40 are of "high concern". For more information about the WQI please visit https://green2.kingcounty.gov/streamsdata/WQI.aspx

For more information about this creek please visit our website at http://green.kingcounty.gov/WLR/Waterres/StreamsData/streamlist.aspx

King County DNRP Water Quality Index

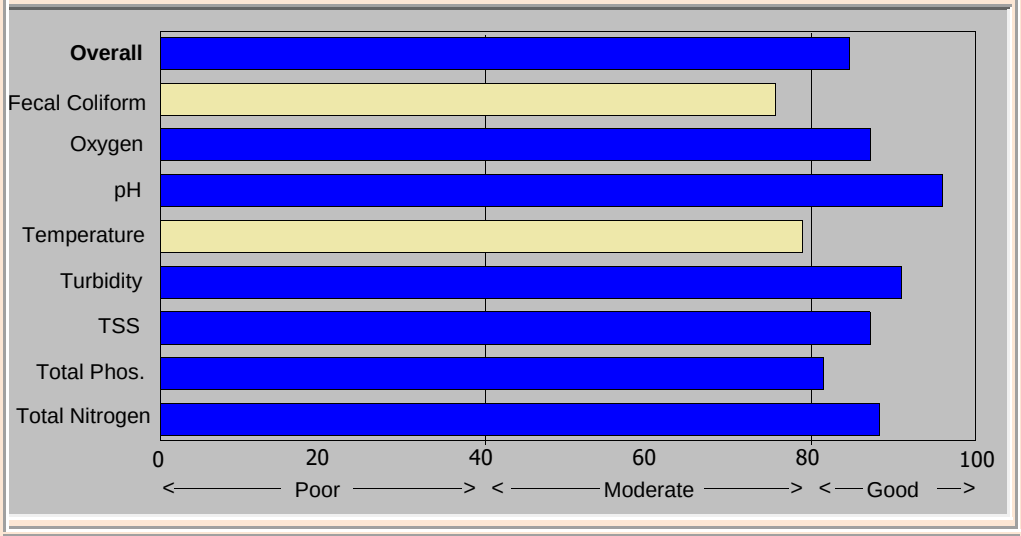
STATION A320 WATER YEAR 2020

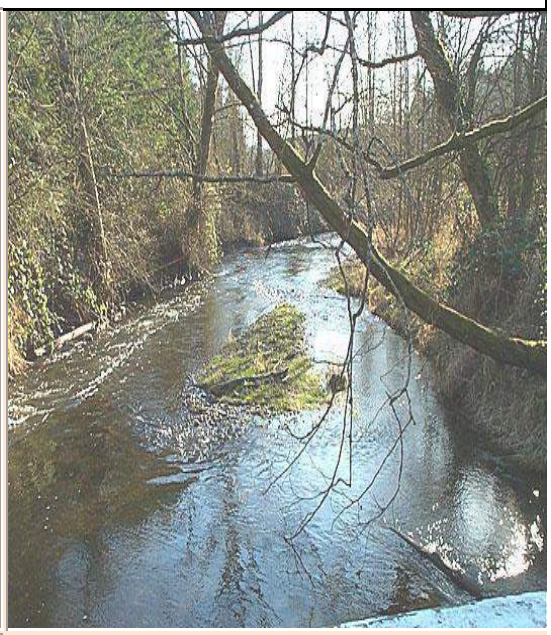
GAUGE # 54a **Soos Creek at Mouth** **Overall Index** 85

King County monitors water quality on Soos Creek at four locations. Station A320 is located at the USGS gaging station roughly 300 feet upstream of the hatchery near the mouth of the creek. Monitoring at this site began in 1972 and continues today. The Soos Creek basin encompasses 44,800 acres east of the City of Kent and drains into the Green River. The creek system contains 60 miles of stream, including 4 main tributaries – Covington Creek, Jenkins Creek, Little Soos Creek, and Soosette. The Soos Creek basin is an extensive system of interacting lakes, wetlands and permeable soils that collectively attenuate peak stream flows. However, increasing urban development, particularly in the western half of the basin, has led to increasing water temperature and more dramatic seasonal flow fluctuations. All five species of Pacific Salmon as well as steelhead and coastal cutthroat trout have been observed in the Soos Creek basin.

Annual Water Quality Index Scores

Water quality was GOOD based on data collected 10/1/2019 to 9/30/2020.

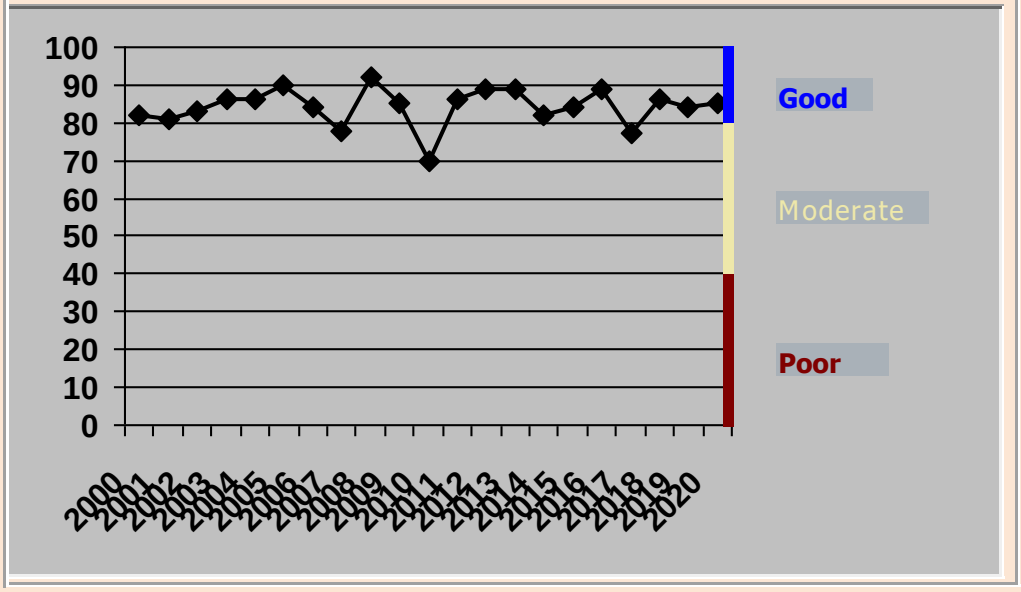




Monthly Scores For Water Year 2020

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
95	94	96	95	88	97		90	77	93	89	89

WQI Score Comparison By Water Year



About The Water Quality Index:

The Water Quality Index (WQI) score is a unit-less number ranging from 10 to 100: the higher the number, the higher the water quality. Scores are calculated from data collected during the monthly routine sampling. For temperature, pH, fecal coliform bacteria, turbidity, and dissolved oxygen, the index expresses results relative to levels required to maintain beneficial uses according to criteria in Washington's Water Quality Standards, WAC 173-201A. For nutrient and sediment measures where there are no standard, results are expressed relative to guidelines for this eco-region. Results from the eight parameters are aggregated over time to produce a single score for each sample station. In general, stations scoring 80 and above did not fail water quality standards or guidelines and are of "low concern", scores 40 to 80 indicate "moderate concern", and water quality at stations with scores below 40 are of "high concern". For more information about the WQI please visit https://green2.kingcounty.gov/streamsdata/WQI.aspx

For more information about this creek please visit our website at http://green.kingcounty.gov/WLR/Waterres/StreamsData/streamlist.aspx

SA Water Quality Index for Washington State streams (Version 6: 2014.06.11).

Station:	10C095
Recreation Use:	Primary
Aquatic Life (Temperature):	Core(16)
Aquatic Life (Oxygen):	Core
Supplemental Spawning:	09/15 to 07/01
Ecoregion:	2
Small Puget Sound Stream:	No

Calc Interim WQI scores

Calc Constituent & Overall Scores

KEY
Input
Low Concern
Moderate Concern
High Concern

OutSeason 5
SupSpawn 515

	FC	Oxygen	pH	TP	TSS	Temp	TN	Turbidity	Monthly
Default Curve No.:	51	26	41	72	82	515	62	92	
Curve to Use:	51	26	41	72	82	515	62	92	
Date	col/100mL	mg/L	std. Units	mg/L	mg/L	C	mg/L	NTU	Scores
9/24/2008 8:35	16	11.1	7.54	0.0622	50	9.8	0.15	20	77
8/20/2008 8:50	81	10.5	7.59	0.314	318	13.9	0.098	110	60
7/23/2008 8:50	26	10.9	7.53	0.0847	108	12.4	0.068	55	66
6/18/2008 8:25	6	11.6	7.45	0.182	628	8.6	0.079	37	64
5/21/2008 8:50	27	11.55	7.31	0.254	515	7.9	0.09	160	65
4/23/2008 9:15	9	12.3	7.77	0.016	11	6.8	0.205	2.1	98
3/19/2008 9:20	11	13.5	7.54	0.022	33	4.8	0.346	3.2	96
2/27/2008 10:25	4	12.81	7.84	0.018	20	5.3	0.287	1.7	97
1/30/2008 8:35	36	13.8	7.57	0.034	11	2.1	0.608	3.4	90
12/19/2007 11:05	21	12.7	7.56	0.055	55	9	0.492	5.8	93
11/28/2007 9:00	7	13.1	7.59	0.027	24	4.2	0.286	4	96
10/31/2007 9:27	15	12.9	7.63	0.033	33	4.2	0.256	5.9	86
Constituent Scores:	88	89	96	16	19	87	84	35	
							Overall Score:		**63**

Source: Ecology Water Quality Index Spreadsheet

WATER QUALITY ASSESSMENTS

Table A-5. 303(d) List

Category Rank	Category	Category Definition
1	Meets Tested Criteria	Recent data is sufficient in showing attainment of the applicable water quality standard for the assessed parameter. Placement in this category does not mean the assessment unit is compliant with standards for any other purpose (i.e., permitting). Not part of the 303(d) list.
2	Water of Concern	If Ecology determines that the data for an assessment unit parameter indicate credible concern but there are fewer exceedances than necessary for placement in Category 5, then the assessment unit will be placed in this category. Not part of the 303(d) list.
3	Insufficient Data to Make Determination	Assessment units with insufficient data to determine whether the water quality parameter in question has met the use standard. Not part of the 303(d) list.
4	4 Impaired but Does Not Require a TMDL	Not part of the 303(d) list but still impaired. Category 4 is broken up into 4A, 4B, and 4C.
	4A Has a TMDL Approved by EPA	When a TMDL for a parameter in an impaired assessment unit is approved by the EPA, Ecology reassigns the parameter for that assessment unit from Category 5 to Category 4A. If Ecology deems the TMDL is not being implemented, then the assessment unit parameter may be moved by to Category 5 to flag it for further action.
	4B Has a Pollution Control Program That Is Being Actively Implemented	When Ecology determines that a local, state, or federal program/strategy is implementing a pollution control program with the expectation of attaining water quality standards for an impaired assessment unit parameter, Ecology will place the Category 5 listing in question into Category 4B for review by the EPA.
	4C Impaired by a Non-Pollutant	When an assessment unit parameter fails to meet applicable water quality standards, but the cause is by a type of pollution not adequately addressed by development of a TMDL. Impaired designated uses caused by degradation but not resulting in the exceedance of a pollutant criterion would be placed here. Non-pollutant factors that cause impairment would be placed in this category and include physical habitat alterations and/or fish migration barriers, invasive exotic species, flow alterations, and degraded biological integrity.
5	The 303(d) List	Ecology will place an assessment unit parameter in Category 5 when data shows water quality criteria are not persistently attained, or narrative evidence indicates designated use impairment by a pollutant. Placement in this category means the associated designated use of the waterbody segment in question is impaired. If an assessment unit is projected to exceed applicable water quality standards through trend analysis, Ecology may preemptively move the assessment unit to this category. Only assessment units ranked as Category 5 are included in the 303(d) list for review by the EPA. All assessment units in Category 5 will need a TMDL, pollution control program, or other action to bring the waterbody into compliance.

Source: Ecology 2020

Attachment A2

Water Quality Assessment Listings by Receiving Water and Main Listing Information

Table A2-1. Water Quality Assessment Listings by Receiving Water

Receiving Water	Category	Listing ID	Listing Parameter
Green River	5	70167	Bioassessment
Green River	5	10819	Dissolved Oxygen
Green River	5	47547	Dissolved Oxygen
Green River	5	47551	Dissolved Oxygen
Green River	4A	7479	Temperature
Green River	4A	7480	Temperature
Green River	4A	48625	Temperature
Green River	4A	72609	Temperature
Mill Creek	5	7485	Bacteria
Mill Creek	5	70175	Bioassessment
Mill Creek	5	7488	Dissolved Oxygen
Mill Creek	5	12645	pH
Mill Creek	4A	7041	Temperature
Mullen Slough	5	15767	Bacteria
Mullen Slough	5	70164	Bioassessment
Mullen Slough	4A	15828	Temperature
Olson Creek	5	70165	Bioassessment
Olson Creek	4A	72602	Temperature
Soosette and Big Soos Creeks	5	15837	Bacteria
Soosette and Big Soos Creeks	5	15840	Bacteria
Soosette and Big Soos Creeks	5	15849	Bacteria
Soosette and Big Soos Creeks	5	70181	Bioassessment
Soosette and Big Soos Creeks	5	10835	Dissolved Oxygen
Soosette and Big Soos Creeks	5	15836	Dissolved Oxygen
Soosette and Big Soos Creeks	5	7493	Temperature
Soosette and Big Soos Creeks	5	13964	Temperature
White River	5	9383	Dissolved Oxygen
White River	5	7524	pH
White River	5	7525	pH
White River	5	7523	Temperature
White River	4A	9844	Bacteria
White River	4A	45737	Bacteria

Main Listing Information

Listing ID: 70167
Waterbody Name: UNNAMED CREEK (TRIB TO GREEN RIVER)
Medium: Other
Parameter: Bioassessment
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013007632 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09LOW0788] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 24 in 2006, 20 in 2007, 20 in 2008, 20 in 2009, 20 in 2010

Remarks

The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score ≤ 27 and a RIVPACS score less than 0.73 indicates degraded biological integrity.

The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.

The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70167)

Main Listing Information

Listing ID: 10819
Waterbody Name: GREEN RIVER
Medium: Water
Parameter: Dissolved Oxygen
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	1
1998	N
1996	Y

Assessment Unit

Assessment Unit ID: 17110013002272 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: [KCM-A319] -- In 2008, 0 of 12 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-A319] -- In 2007, 3 of 12 sample values (25%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-A319] -- In 2006, 0 of 11 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-A319] -- In 2005, 2 of 12 sample values (17%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-A319] -- In 2004, 2 of 11 sample values (18%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

King County unpublished data from station A319 show 0 excursions beyond the criterion out of 48 all samples collected between 1998 and 2002. King County unpublished data from station A319 (Green RM 34.) show no excursions beyond the dissolved oxygen criterion from all samples collected between 1998 and 2002.

Hallock (2001) Dept. of Ecology Ambient Monitoring Station 09A130 (Green Abv Big Soos/Auburn) shows 0 excursions beyond the criterion out of 12 samples collected between 1993 - 2001

Remarks

Historic Remarks: Critical temporal period not adequately captured to conclude non-impairment based on WQP Policy 1-11 (Sept 2006). -mh

Ten percent or more of the samples collected in a single year were excursions of the criterion, and at least 3 excursions exist from all data considered.

Data Sources

Study Id	Location Id
KCstrm-1	KCM-A319

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=10819)

Main Listing Information

Listing ID: 47547
Waterbody Name: GREEN RIVER
Medium: Water
Parameter: Dissolved Oxygen
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000017 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09-GRE-277] -- In 2006, 1 of 2 samples (50.0%) showed an excursion of the criterion for this waterbody, (criterion = 8.0 mg/L).
Location ID: [09-GRE-167] -- In 2006, 4 of 4 sample values (100%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Remarks

Ten percent or more of the samples collected in a single year were excursions of the criterion, and at least 3 excursions exist from all data considered.

Combined Listing: Listing ID 47548 was rolled into this listing

Data Sources

Study Id	Location Id
MROB003	09-GRE-167
MROB003	09-GRE-277
MROB003	09-GRE-167
MROB003	09-GRE-277

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=47547)

Main Listing Information

Listing ID: 47551
Waterbody Name: GREEN RIVER
Medium: Water
Parameter: Dissolved Oxygen
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013002273 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: [09-GRE-GRE] -- In 2006, 4 of 4 sample values (100%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Remarks

Ten percent or more of the samples collected in a single year were excursions of the criterion, and at least 3 excursions exist from all data considered.

Data Sources

Study Id	Location Id
MROB003	09-GRE-GRE
MROB003	09-GRE-GRE

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=47551)

Main Listing Information

Listing ID: 7479
Waterbody Name: GREEN RIVER
Medium: Water
Parameter: Temperature
WQI Project: Green River Temperature Watershed
Designated Use: None

Year	Category
2014	4A
2012	4A
2008	5
2004	5
1998	Y
1996	Y

Assessment Unit

Assessment Unit ID: 17110013000017 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: 09-GRE-167 -- In 2006, between 6/22/2006 and 9/5/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 70 of 76 days (92%); The maximum exceedance during this period was 21.42°C for the 7-day period centered on 7/24/2006 ;

{Supplemental Spawning Period}: Location ID: 09-GRE-277 -- In 2006, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 4 of 10 days (40%); The maximum exceedance during this period was 18.06°C for the 7-day period centered on 6/28/2006 ;

Location ID [09-GRE-277] -- between 6/22/2006 and 9/5/2006 there were 70 occurences in which the 7-day mean of daily maximum values (7DADmax) exceeded the temperature criterion for this waterbody, (criterion = 16°C); the maximum exceedance during this period was 20.94°C for the 7-day period ending July 27, 2006.

Caldwell, 1994, multiple excursions beyond the criterion at RM 27 in 1992.

Remarks

The temperature impairment in this water body is addressed by the Green River Temperature TMDL, approved by EPA 8/11/11.
The Core Summer Salmonid Habitat temperature criterion (16°C) applies to this assessment unit. Supplemental Spawning criterion (13°C) applies from Sept. 15 through July 1.
As a result of merging of three stream reaches into a single assessment unit in 2014, this record was merged with the records formerly associated with the Listing IDs 48623 and 48624. This does not affect the existing Category 4A determination for this assessment unit.
Combined Listing: Listing IDs 48624, 48623, 45187 were rolled into this listing

Data Sources

Study Id	Location Id
MROB003	09-GRE-277
MROB003	09-GRE-167
MROB003	09-GRE-167
MROB003	09-GRE-277

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7479)

Main Listing Information

Listing ID: 7480
Waterbody Name: GREEN RIVER
Medium: Water
Parameter: Temperature
WQI Project: Green River Temperature Watershed
Designated Use: None

Year	Category
2014	4A
2012	4A
2008	5
2004	5
1998	Y
1996	Y

Assessment Unit

Assessment Unit ID: 17110013002273 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: 09-GRE-GRE -- In 2006, between 7/2/2006 and 9/5/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 60 of 66 days (91%); The maximum exceedance during this period was 21.58°C for the 7-day period centered on 7/24/2006 ;

Caldwell, 1994. multiple excursions beyond the criterion at RM 35 in 1992.

Remarks

Part of the Green River Temperature TMDL. Approved by EPA 8/11/11.

Continuous temperature measurements were taken, but results reported as single day maximums. Category 5 listing is continued from 1998 assessment based on multiple excursions from continuous monitoring.

Historical Remarks: Part of the Green River Temperature TMDL. Approved by EPA 8/11/11. Continuous temperature measurements were taken, but results reported as single day maximums. Category 5 listing is continued from 1998 assessment based on multiple excursions from continuous monitoring.

Combined Listing: Listing ID 48626 was rolled into this listing

Data Sources

Study Id	Location Id
MROB003	09-GRE-GRE
MROB003	09-GRE-GRE

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7480)

Main Listing Information

Listing ID: 48625
Waterbody Name: GREEN RIVER
Medium: Water
Parameter: Temperature
WQI Project: Green River Temperature Watershed
Designated Use: None

Year	Category
2014	4A
2012	4A
2008	5
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013002271 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: 09-GRE-8TH -- In 2006, between 7/2/2006 and 9/5/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 60 of 66 days (91%); The maximum exceedance during this period was 20.98°C for the 7-day period centered on 7/24/2006 ;

Remarks

Part of the Green River Temperature TMDL. Approved by EPA 8/11/11.
Historical Remarks: Part of the Green River Temperature TMDL. Approved by EPA 8/11/11.

Data Sources

Study Id	Location Id
MROB003	09-GRE-8TH
MROB003	09-GRE-8TH

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=48625)

Main Listing Information

Listing ID: 72609
Waterbody Name: GREEN RIVER
Medium: Water
Parameter: Temperature
WQI Project: Green River Temperature Watershed
Designated Use: None

Year	Category
2014	4A
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013002270 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: KC_T_GRT35 -- In 2006, between 7/2/2006 and 9/14/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 69 of 75 days (92%); The maximum exceedance during this period was 20.87°C for the 7-day period centered on 7/24/2006 ;
(External Data Source: King County Database)

Location ID: KC_T_GRT35 -- In 2005, between 7/2/2005 and 9/14/2005, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 66 of 75 days (88%); The maximum exceedance during this period was 19.46°C for the 7-day period centered on 7/29/2005 ;
(External Data Source: King County Database)

Location ID: KC_T_GRT35 -- In 2004, between 7/2/2004 and 9/14/2004, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 69 of 75 days (92%); The maximum exceedance during this period was 20.64°C for the 7-day period centered on 7/25/2004 ;
(External Data Source: King County Database)

Location ID: KC_T_GRT35 -- In 2003, between 7/2/2003 and 9/14/2003, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 69 of 75 days (92%); The maximum exceedance during this period was 20.54°C for the 7-day period centered on 7/29/2003 ;
(External Data Source: King County Database)

Location ID: KC_T_GRT35 -- In 2002, between 7/31/2002 and 9/14/2002, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 34 of 46 days (74%); The maximum exceedance during this period was 18.97°C for the 7-day period centered on 8/14/2002 ;
(External Data Source: King County Database)

Remarks

Data for 2002 does not cover the core critical season for temperature. Maximum temperatures may be higher than observed data;

The TMDL either set a load allocation for this segment, OR downstream of the subject segment and requires implementation of the entire area to produce measured reductions that will allow the most downstream segment to meet the allocation. Therefore, this segment can be moved to Category 4A.

The temperature impairment in this Assessment Unit is addressed by the Green River Temperature TMDL

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=72609)

Main Listing Information

Listing ID: 7485
Waterbody Name: MILL CREEK
Medium: Water
Parameter: Bacteria
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	5
1998	Y
1996	N

Assessment Unit

Assessment Unit ID: 17110013002282 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: [KCM-A315] -- In water year 2009, 1 of 3 sample values (33%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). Fewer than five samples were available, therefore a geometric mean was not calculated for this period.

Location ID: [KCM-A315] -- In water year 2008, 3 of 12 sample values (25%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 52.2 does not exceed the geometric mean criterion (100 cfu/100mL).

Location ID: [KCM-A315] -- In water year 2007, 4 of 11 sample values (36%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 69.2 does not exceed the geometric mean criterion (100 cfu/100mL).

Location ID: [KCM-A315] -- In water year 2006, 6 of 13 sample values (46%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 253.4 exceeds the geometric mean criterion (100 cfu/100mL).

Location ID: [KCM-A315] -- In water year 2005, 4 of 13 sample values (31%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 150.4 exceeds the geometric mean criterion (100 cfu/100mL).

Location ID: [KCM-A315] -- In water year 2004, 6 of 12 sample values (50%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 110.2 exceeds the geometric mean criterion (100 cfu/100mL).

King County unpublished data from station A315 (Hill Creek RM 0.3) show standards were not met each year in samples collected between 1998 and 2002.

King County, 1993, 9 excursions beyond the upper criterion at station 201 (RM 0.2) during 1992 and 1993.

King County, 1993, 12 excursions beyond the upper criterion at station 302 (RM 1.0) during 1992 and 1993.

King County, 1993, 12 excursions beyond the upper criterion at station 303 (RM 1.4) during 1992 and 1993.

King County, 1993, 6 excursions beyond the upper criterion at station 304 (RM 2.2) during 1992 and 1993.

King County, 1993, 6 excursions beyond the upper criterion at station 305 (RM 7.5) during 1992 and 1993.

Remarks

Policy 1-11 was revised in July 2012 to specify that bacteria is assessed according to water year (Oct-Sept 30) from the previous assessment period of calendar year. the water water assessment is only applied to newly assessed data. Therefore, this listing contains data assessed by both water year and calendar year.
This listing contains E.coli data. E. coli is a subset of Fecal coliform bacteria therefore E.coli levels above the Fecal coliform standard can be used to infer an exceedance of this water quality standard.
Impairment was determined by exceedance of the geometric mean criterion in water year(s) 2006, 2005, and2004, and the percent criterion in water year(s) 2009, 2008, 2007, 2006, 2005, 2004.
Combined Listing: Listing IDs 15820, 15817, 15815, 7486 were rolled into this listing

Data Sources

Study Id	Location Id
KCstrm-1	KCM-A315

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7485)

Main Listing Information

Listing ID: 70175
Waterbody Name: HILL (MILL) CREEK
Medium: Other
Parameter: Bioassessment
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013002282 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09MIL0340] - the Benthic Index of Biotic Integrity (B-IBI) score was 26 in 2006, 28 in 2007, 24 in 2009, 24 in 2010.

Location ID [09MIL0390] - the Benthic Index of Biotic Integrity (B-IBI) score was 24 in 2006, 30 in 2007, 34 in 2008, 30 in 2009, 26 in 2010.

Location ID [09MIL0497] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 10 in 2006

Remarks

The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score ≤ 27 and a RIVPACS score less than 0.73 indicates degraded biological integrity.

The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.

The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70175)

Main Listing Information

Listing ID: 7488
Waterbody Name: HILL (MILL) CREEK
Medium: Water
Parameter: Dissolved Oxygen
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	5
1998	Y
1996	N

Assessment Unit

Assessment Unit ID: 17110013002282 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: [KCM-A315] -- In 2008, 8 of 12 sample values (67%) showed an excursion of the criterion (8 mg/L) for this waterbody;

Location ID: [KCM-A315] -- In 2007, 10 of 12 sample values (83%) showed an excursion of the criterion (8 mg/L) for this waterbody;

Location IDs: [KCM-A315], [09-MIL-WAS] -- In 2006, 11 of 15 sample values (73%) showed an excursion of the criterion (8 mg/L) for this waterbody;

Location ID: [KCM-A315] -- In 2005, 11 of 14 sample values (79%) showed an excursion of the criterion (8 mg/L) for this waterbody;

Location ID: [KCM-A315] -- In 2004, 11 of 13 sample values (85%) showed an excursion of the criterion (8 mg/L) for this waterbody;

King County unpublished data from station A315 (Hill Creek RM 0.3) show excursions beyond the dissolved oxygen criterion in 1998, 1999, 2000, 2001 and 2002.

King County, 1993, 10 excursions out of 10 samples (100%) beyond the criterion at station 302 (RM 1.0) during 1992 and 1993.
King County, 1993, 9 excursions out of 10 samples (90%) beyond the criterion at station 303 (RM 1.4) during 1992 and 1993.
King County, 1993, 3 excursions out of 7 samples (43%) beyond the criterion at station 304 (RM 2.2) during 1992 and 1993.
King County, 1993, 1 excursions out of 10 samples (10%) beyond the criterion at station 305 (RM 7.5) during 1992 and 1993.

Remarks

Ten percent or more of the samples collected in a single year were excursions of the criterion, and at least 3 excursions exist from all data considered.

Combined Listing: Listing IDs 15814, 15811, 15810, 12707, 47539 were rolled into this listing

Data Sources

Study Id	Location Id
KCstrm-1	KCM-A315
KCstrm-1	KCM-A315
MROB003	09-MIL-WAS

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7488)

Main Listing Information

Listing ID: 12645
Waterbody Name: MILL CREEK
Medium: Water
Parameter: pH
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	2
2008	2
2004	2
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013002282 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [KCM-A315] -- In 2008, 0 of 15 sample values (0%) showed an excursion of the criteria for this waterbody;

Location ID [KCM-A315] -- In 2007, 1 of 12 sample values (8%) showed an excursion of the criteria for this waterbody;

Location ID [KCM-A315], [09-MIL-WAS] -- In 2006, 0 of 15 sample values (0%) showed an excursion of the criteria for this waterbody;

Location ID [KCM-A315] -- In 2005, 0 of 14 sample values (0%) showed an excursion of the criteria for this waterbody;

Location ID [KCM-A315] -- In 2004, 2 of 13 sample values (15%) showed an excursion of the criteria for this waterbody;
Location ID [Data from multiple locations] -- In 2006, 0 of 12 samples (0.0%) showed an excursion of the criteria for this waterbody.

King County unpublished data from station A315 show 3 excursions beyond the criteria out of 73 all samples collected between 1998 and 2002.

Remarks

Low pH Excursions
At least 10 percent of samples were excursion of the criteria in at least one year and at least 3 excursions exist from all data considered.
Combined Listing: Listing ID 50827 was rolled into this listing

Data Sources

Study Id	Location Id
KCstrm-1	KCM-A315
MROB003	09-MIL-WAS

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=12645)

Main Listing Information

Listing ID: 7041
Waterbody Name: HILL (MILL) CREEK
Medium: Water
Parameter: Temperature
WQI Project: Green River Temperature Watershed
Designated Use: None

Year	Category
2014	4A
2012	5
2008	5
2004	5
1998	Y
1996	N

Assessment Unit

Assessment Unit ID: 17110013002282 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: KC_T_41a -- In 2010, between 1/1/2010 and 12/31/2010, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (17.5°C) on 72 of 365 days (20%); The maximum exceedance during this period was 21.57°C for the 7-day period centered on 7/9/2010 ;
(External Data Source: King County Database)

Location ID: KC_T_41a -- In 2009, between 1/1/2009 and 12/31/2009, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (17.5°C) on 124 of 365 days (34%); The maximum exceedance during this period was 23.58°C for the 7-day period centered on 7/29/2009; (External Data Source: King County Database)

Location IDs: KC_T_41a / KC_T_41c -- In 2008, between 1/1/2008 and 12/31/2008, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (17.5°C) on 93 of 366 days (25%); The maximum exceedance during this period was 21.53°C for the 7-day period centered on 6/30/2008; (External Data Source: King County Database)

Location IDs: KC_T_41c / KC_T_41a -- In 2007, between 1/1/2007 and 12/31/2007, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (17.5°C) on 94 of 365 days (26%); The maximum exceedance during this period was 22.77°C for the 7-day period centered on 7/12/2007; (External Data Source: King County Database)

Location IDs: KC_T_41a / KC_T_41c / 09-MIL-WAS / KC_T_mf1 -- In 2006, between 1/1/2006 and 12/31/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (17.5°C) on 87 of 365 days (24%); The maximum exceedance during this period was 22.07°C for the 7-day period centered on 7/24/2006; (Location IDs: KC_T_41a, KC_T_41c, and KC_T_mf1 from External Data Source: King County Database)

King County unpublished data from station A315 (Hill Creek RM 0.3) show temperature criterion was exceeded in 1998 and 2000.

King County, 1993, 2 excursions out of 9 samples (22%) beyond the criterion at station 201 (RM 0.2) during 1992 and 1993.

King County, 1993, 2 excursions out of 10 samples (20%) beyond the criterion at station 303 (RM 1.4) during 1992 and 1993.

King County, 1993, 2 excursions out of 9 samples (22%) beyond the criterion at station 304 (RM 2.2) during 1992 and 1993.

King County, 1993, 1 excursions out of 9 samples (11%) beyond the criterion at station 306 (Tributary at RM 7.2) during 1992 and 1993.

Remarks

As a result of merging of four stream reaches into a single assessment unit in 2014, this record was merged with the records formerly associated with the Listing IDs 7487, 15821, 15822.This does not affect the existing Category 5 determination for this assessment unit.

Spawning and Rearing temperature criterion (17.5°C) applies to this assessment unit.

The TMDL either set a load allocation for this segment, OR downstream of the subject segment and requires implementation of the entire area to produce measured reductions that will allow the most downstream segment to meet the allocation. Therefore, this segment is associated with the TMDL load allocations and can be moved to Category 4A.

Combined Listing: Listing IDs 48617, 15822, 15821, 7487 were rolled into this listing

Data Sources

Study Id	Location Id
KCstrm-1	KCM-A315
MROB003	09-MIL-WAS

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7041)

Main Listing Information

Listing ID: 15767
Waterbody Name: MULLEN SLOUGH
Medium: Water
Parameter: Bacteria
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	5
1998	Y
1996	N

Assessment Unit

Assessment Unit ID: 17110013000158 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

King County, 1993, 9 excursions beyond the upper criterion at station 407 (Mullen Slough RM 0.5) during 1992 and 1993.

King County, 1993, 9 excursions beyond the upper criterion at station 408 (Mullen Slough RM 1.6) during 1992 and 1993.

Remarks

Fecal coliform data were previously submitted only in hardcopy form. The water segment is listed as Category 5 based on the 1998 assessment.

Combined Listing: Listing ID 15827 was rolled into this listing

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=15767)

Main Listing Information

Listing ID: 70164
Waterbody Name: MULLEN SLOUGH
Medium: Other
Parameter: Bioassessment
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000158 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09LOW0406] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 14 in 2006, 14 in 2007, 16 in 2008, 12 in 2009, 18 in 2010

Remarks

The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.

The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score ≤ 27 and a RIVPACS score less than 0.73 indicates degraded biological integrity.

The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70164)

Main Listing Information

Listing ID: 15828
Waterbody Name: MULLEN SLOUGH
Medium: Water
Parameter: Temperature
WQI Project: Green River Temperature Watershed
Designated Use: None

Year	Category
2014	4A
2012	5
2008	5
2004	2
1998	Y
1996	N

Assessment Unit

Assessment Unit ID: 17110013000158 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: 09-FRA-FRA -- In 2006, between 6/22/2006 and 9/5/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (17.5°C) on 58 of 76 days (76%); The maximum exceedance during this period was 23.5°C for the 7-day period centered on 7/24/2006 ;

King County, 1993, 2 excursions out of 11 samples (18%) beyond the upper criterion at station 408 (Mullen Slough RM 1.6) during 1992 and 1993.

King County, 1993, 2 excursions out of 10 samples (20%) beyond the upper criterion at station 407 (Mullen Slough RM 0.5) during 1992 and 1993.

Remarks

The daily maximum excursions are for two years only and do not meet the WQ Program Policy 1-11 (updated 9/02) for showing persistent temperature impairment. Listing will be placed in waters of concern category until further study and monitoring indicates the status of the water. - Imported 06/11/2007

As a result of merging of two stream reaches into a single assessment unit in 2014, this record was merged with the record formerly associated with the Listing ID 15829.

Spawning and Rearing temperature criterion (17.5°C) applies to this assessment unit.

The TMDL either set a load allocation for this segment, OR downstream of the subject segment and requires implementation of the entire area to produce measured reductions that will allow the most downstream segment to meet the allocation. Therefore, this segment can be moved to Category 4A.

The temperature impairment in this Assessment Unit is addressed by the Green River Temperature TMDL

Combined Listing: Listing IDs 48633, 15829 were rolled into this listing

Data Sources

Study Id	Location Id
MROB003	09-FRA-FRA

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=15828)

Main Listing Information

Listing ID: 70165
Waterbody Name: UNNAMED CREEK (TRIB TO GREEN RIVER)
Medium: Other
Parameter: Bioassessment
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000169 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09LOW0751] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 36 in 2006, 26 in 2007, 30 in 2008, 28 in 2009, 22 in 2010

Remarks

The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score ≤ 27 and a RIVPACS score less than 0.73 indicates degraded biological integrity.

The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.

The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70165)

Main Listing Information

Listing ID: 72602
Waterbody Name: OLSEN CREEK
Medium: Water
Parameter: Temperature
WQI Project: Green River Temperature Watershed
Designated Use: None

Year	Category
2014	4A
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000169 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: KC_T_GRT03 -- In 2008, between 1/1/2008 and 6/23/2008, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 0 of 175 days (0%); (External Data Source: King County Database)

Location ID: KC_T_GRT03 -- In 2007, between 1/1/2007 and 12/31/2007, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 0 of 323 days (0%); (External Data Source: King County Database)

Location ID: KC_T_GRT03 -- In 2006, between 1/26/2006 and 12/31/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 10 of 340 days (3%); The maximum exceedance during this period was 17.54°C for the 7-day period centered on 7/24/2006 ;
(External Data Source: King County Database)

Location ID: KC_T_GRT03 -- In 2005, between 1/1/2005 and 12/7/2005, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 0 of 321 days (0%); (External Data Source: King County Database)

Location ID: KC_T_GRT03 -- In 2004, between 1/1/2004 and 12/31/2004, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 43 of 366 days (12%); The maximum exceedance during this period was 18.51°C for the 7-day period centered on 8/12/2004 ;
(External Data Source: King County Database)

Remarks

Data for 2008 does not cover the core critical season for temperature. Maximum temperatures may be higher than observed data;
FLAG! Review core critical season for 2007 for complete dataset; FLAG! Review core critical season for 2005 for complete dataset;
The TMDL either set a load allocation for this segment, OR downstream of the subject segment and requires implementation of the entire area to produce measured reductions that will allow the most downstream segment to meet the allocation. Therefore, this segment can be moved to Category 4A.
The temperature impairment in this Assessment Unit is addressed by the Green River Temperature TMDL

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=72602)

Main Listing Information

Listing ID: 15837
Waterbody Name: LITTLE SOOSETTE CREEK
Medium: Water
Parameter: Bacteria
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	5
1998	Y
1996	N

Assessment Unit

Assessment Unit ID: 17110013000166 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

King County unpublished data from station X320 (Little Soosette Creek RM 3.1)show excursions beyond the geometric mean criterion in all years between 1994 and 1997.

Remarks

Name was SOOS CREEK SYSTEM on 1998 list. -kk

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=15837)

Main Listing Information

Listing ID: 15840
Waterbody Name: SOOSETTE CREEK
Medium: Water
Parameter: Bacteria
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	5
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000172 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

King County unpublished data from station B320 (Soosette Creek at the mouth) show excursions beyond the geometric mean criterion in 1995 and 1998

Remarks

Previously listed as SOOS CREEK SYSTEM

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=15840)

Main Listing Information

Listing ID: 15849
Waterbody Name: LITTLE SOOSETTE CREEK
Medium: Water
Parameter: Bacteria
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	5
1998	Y
1996	N

Assessment Unit

Assessment Unit ID: 17110013007565 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

King County unpublished data from station V320 (Little Soosette Creek RM 1.6) show excursions beyond the geometric mean criterion in 1993, 1994 and 1997.

Remarks

Name was SOOS CREEK SYSTEM on 1998 list. -kk

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=15849)

Main Listing Information

Listing ID: 70181
Waterbody Name: BIG SOOS CREEK
Medium: Other
Parameter: Bioassessment
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000097 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09SOO0943] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 26 in 2006, 36 in 2007, 26 in 2008, 30 in 2009, 32 in 2010

Remarks

The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score ≤ 27 and a RIVPACS score less than 0.73 indicates degraded biological integrity.

The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.

The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70181)

Main Listing Information

Listing ID: 10835
Waterbody Name: BIG SOOS CREEK
Medium: Water
Parameter: Dissolved Oxygen
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	1
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000097 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: [KCM-A320] -- In 2010, 0 of 12 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-A320] -- In 2009, 1 of 12 sample values (8%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-A320] -- In 2008, 0 of 12 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location IDs: [KCM-A320] [12112600] -- In 2007, 2 of 16 sample values (13%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location IDs: [KCM-A320] [09-SOO-USG] -- In 2006, 1 of 16 sample values (6%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID [KCM-A320] -- In 2005, 14 samples showed no excursions of the criterion for this waterbody, (criterion = 8.0 mg/L).

Location ID [KCM-A320] -- In 2004, 13 samples showed no excursions of the criterion for this waterbody, (criterion = 8.0 mg/L).

King County unpublished data from station A320 (Soos Creek RM 0.7) show no excursions beyond the dissolved oxygen criterion from all samples collected between 1998 and 2002.

Hallock (2001) Dept. of Ecology Ambient Monitoring Station 09B090 (Big Soos Cr nr Auburn) shows 0 excursions beyond the criterion out of 12 samples collected between 1993 - 2001

Remarks

Data from earlier years was compared to a different criteria because the assigned designated use for the waterbody segment was either incorrectly identified or updated in the 2006 standards revisions. Assessment against the current criteria does not change the impairment status of this waterbody.
Single sample event data does not fully represent critical period information necessary to determine this waterbody meets water quality standards.
There is insufficient data to meet minimum requirements according to Policy 1-11.
Data from earlier years was compared to a different criteria because the assigned designated use for the waterbody segment was either incorrectly identified or updated in the 2006 standards revisions. Assessment against the current criteria does not change the impairment status of this waterbody.
Ten percent or more of the samples collected in a single year were excursions of the criterion, and at least 3 excursions exist from all data considered.
Combined Listing: Listing ID 47501 was rolled into this listing

Data Sources

Study Id	Location Id
KCstrm-1	KCM-A320
MROB003	09-SOO-USG

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=10835)

Main Listing Information

Listing ID: 15836
Waterbody Name: LITTLE SOOSETTE CREEK
Medium: Water
Parameter: Dissolved Oxygen
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	5
1998	Y
1996	Y

Assessment Unit

Assessment Unit ID: 17110013000166 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

King County unpublished data from station X320 (Little Soosette Creek RM 3.1) show excursions beyond the criterion in 1994, 1995, 1996, and 1997.

Remarks

Name was SOOS CREEK SYSTEM on 1998 list. -kk

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=15836)

Main Listing Information

Listing ID: 7493
Waterbody Name: BIG SOOS CREEK
Medium: Water
Parameter: Temperature
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	2
2008	2
2004	2
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000097 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: KC_T_54a -- In 2010, between 7/2/2010 and 9/14/2010, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 39 of 75 days (52%); The maximum exceedance during this period was 17.96°C for the 7-day period centered on 8/15/2010 ;

{Supplemental Spawning Period}: Location ID: KC_T_54a -- In 2010, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 56 of 290 days (19%); The maximum exceedance during this period was 15.5°C for the 7-day period centered on 6/25/2010; (External Data Source: King County Database)

Location ID: KC_T_54a -- In 2009, between 7/2/2009 and 9/14/2009, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 42 of 75 days (56%); The maximum exceedance during this period was 20.56°C for the 7-day period centered on 7/30/2009 ;

{Supplemental Spawning Period}: Location ID: KC_T_54a -- In 2009, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 54 of 290 days (19%); The maximum exceedance during this period was 17.24°C for the 7-day period centered on 6/1/2009; (External Data Source: King County Database)

Location ID: KC_T_54a -- In 2008, between 7/2/2008 and 9/14/2008, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 34 of 75 days (45%); The maximum exceedance during this period was 17.78°C for the 7-day period centered on 7/12/2008;

{Supplemental Spawning Period}: Location ID: KC_T_54a -- In 2008, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 40 of 291 days (14%); The maximum exceedance during this period was 17.49°C for the 7-day period centered on 6/27/2008; (External Data Source: King County Database)

Location ID: KC_T_54a -- In 2007, between 7/2/2007 and 9/14/2007, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 35 of 75 days (47%); The maximum exceedance during this period was 18.56°C for the 7-day period centered on 7/8/2007;

{Supplemental Spawning Period}: Location ID: KC_T_54a -- In 2007, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 57 of 290 days (20%); The maximum exceedance during this period was 16.64°C for the 7-day period centered on 6/1/2007; (External Data Source: King County Database)

Location ID: KC_T_54a -- In 2006, between 7/2/2006 and 9/14/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 45 of 75 days (60%); The maximum exceedance during this period was 19.21°C for the 7-day period centered on 7/24/2006;

{Supplemental Spawning Period}: Location ID: KC_T_54a -- In 2006, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 57 of 290 days (20%); The maximum exceedance during this period was 18.05°C for the 7-day period centered on 6/27/2006; (External Data Source: King County Database)

Location ID [09-SOO-USG] -- between 6/22/2006 and 9/5/2006 there were 50 occurences in which the 7-day mean of daily maximum values (7DADmax) exceeded the temperature criterion for this waterbody, (criterion = 16°C); the maximum exceedance during this period was 19.14°C for the 7-day period ending July 27, 2006.

King County unpublished data from station A320 (Soos Creek RM 0.7) show temperature criterion was met in all years between 1998 and 2002.

Hallock (2001) Dept. of Ecology Ambient Monitoring Station 09B090 (Big Soos Cr nr Auburn) shows 1 excursions beyond the criterion out of 12 samples collected between 1993 - 2001 measured on these dates: 94/08/17

2 excursions beyond the criterion out of 301 samples (0.6%) sampled at the inflow to the Green River Fish Hatchery (submitted by Chantal Stevens of the Muckelshoot Indian Tribe on 10/31/97).

Remarks

As a result of merging three stream reaches into a single assessment unit in 2014, this Listing has changed from Category 2 to Category 5 due to the inclusion of data formerly associated with Listing IDs 10837 and 48615.

The Core Summer Salmonid Habitat temperature criterion (16°C) applies to this assessment unit. Supplemental Spawning Criteria (13°C) apply from Sept. 15 - July 1.

Combined Listing: Listing IDs 48615, 10837 were rolled into this listing

Data Sources

Study Id	Location Id
KCstrm-1	KCM-A320
MROB003	09-SOO-USG
MROB003	09-SOO-USG

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7493)

Main Listing Information

Listing ID: 13964
Waterbody Name: SOOSETTE CREEK
Medium: Water
Parameter: Temperature
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	1
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000172 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: KC_T_54h -- In 2010, between 1/1/2010 and 12/31/2010, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 0 of 365 days (0%); ; (External Data Source: King County Database)

Location ID: KC_T_54h -- In 2009, between 1/1/2009 and 12/31/2009, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 6 of 365 days (2%); The maximum exceedance during this period was 16.59°C for the 7-day period centered on 7/30/2009 ; (External Data Source: King County Database)

Location ID: KC_T_54h -- In 2008, between 1/1/2008 and 12/31/2008, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 0 of 366 days (0%); ; (External Data Source: King County Database)

Location ID: KC_T_54h -- In 2007, between 1/1/2007 and 12/31/2007, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 4 of 365 days (1%); The maximum exceedance during this period was 16.24°C for the 7-day period centered on 7/22/2007 ; (External Data Source: King County Database)

Location ID: KC_T_54h -- In 2006, between 1/1/2006 and 12/31/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 5 of 365 days (1%); The maximum exceedance during this period was 16.61°C for the 7-day period centered on 7/24/2006 ; (External Data Source: King County Database)

King County unpublished data from station B320 (Soosette Creek at the mouth) show no excursions beyond the criterion in mesurements collected between 1993-1997.

Remarks

Unknown if critical temporal period adequately captured to conclude non-impairment based on WQP Policy 1-11. -mh
There is insufficient data to meet minimum requirements according to Policy 1-11.
Historical Remarks: There is insufficient data to meet minimum requirements according to Policy 1-11. Unknown if critical temporal period adequately captured to conclude non-impairment based on WQP Policy 1-11. -mh

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=13964)

Main Listing Information

Listing ID: 9383
Waterbody Name: BOWMAN CREEK
Medium: Water
Parameter: Dissolved Oxygen
WQI Project: Puyallup River Multiparameter TMDL
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	1
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110014001317 **County:** King
WRIA: 10 - Puyallup-White

Basis Statement

Location ID [BOWMAN] -- In 1996, 6 of 6 sample values (100.0%) showed an excursion of the criteria for this waterbody, (criterion = 9.5 mg/L). Erickson (1999) station BOWMAN (Bowman Creek (BOWMAN)) shows 0 excursions beyond the criterion out of 6 samples collected between 06/96 - 11/97.

Remarks

Single sample event data does not fully represent critical period information necessary to determine this waterbody meets water quality standards.

Critical temporal period not adequately captured to conclude non-impairment based on WQP Policy 1-11 (Sept 2006). -mh

Combined Listing: Listing ID 47516 was rolled into this listing

Data Sources

Study Id	Location Id
KERI0003	BOWMAN

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=9383)

Main Listing Information

Listing ID: 7524
Waterbody Name: WHITE RIVER
Medium: Water
Parameter: pH
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	5
1998	Y
1996	Y

Assessment Unit

Assessment Unit ID: 17110014005509 **County:** King
WRIA: 10 - Puyallup-White

Basis Statement

Location ID [10-WHT-8.5] -- In 2009, 0 of 9 sample values (0%) showed an excursion of the criteria for this waterbody;

Location ID [10C095] -- In 2008, 0 of 9 sample values (0%) showed an excursion of the criteria for this waterbody;

Location ID [10C095] -- In 2007, 0 of 3 sample values (0%) showed an excursion of the criteria for this waterbody;

Location ID [10C095] -- In 2006, 0 of 9 sample values (0%) showed an excursion of the criteria for this waterbody;

Location ID [10C095] -- In 2005, 0 of 12 sample values (0%) showed an excursion of the criteria for this waterbody;

Location ID [10C095] -- In 2004, 0 of 12 samples (0.0%) showed an excursion of the criteria for this waterbody.

Hallock (2004), Dept. of Ecology ambient station 10C095 shows that 2 of 31 samples exceed the criterion.

Location ID [WHI08.0] -- In 1997, 2 of 14 samples (14.3%) showed an excursion of the criteria for this waterbody: 2 high pH excursions.

Hallock (2001) Dept. of Ecology Ambient Monitoring Station 10C095 (White River @ R Street) shows 2 excursions beyond the criterion out of 12 samples collected between 1993 - 2001.

Erickson (1999) station WHI08.0 (White River (WHI08.0)) shows 3 excursions beyond the criterion out of 20 samples collected between 06], [96 - 11], [97.

Pelletier, 1993, 4 excursions beyond the criterion out of 7 samples from RM 8.0 on 9], [18], [90, 9], [19], [90, 10], [2], [90 and 10], [3], [90.

Remarks

Combined Listing: Listing IDs 50842, 14779 were rolled into this listing

Two sections of the NHD reach are on tribal lands. The listing covers the two sections of the NHD reach that are not on non-tribal lands. Only the lower portion of the reach on non-tribal lands is displayed in the map.

Data Sources

Study Id	Location Id
AMS001	10C095
AMS001E	10C095
KERI0003	WHI08.0
NMat0002	10-WHT-8.5

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7524)

Main Listing Information

Listing ID: 7525
Waterbody Name: WHITE RIVER
Medium: Water
Parameter: pH
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	5
1998	Y
1996	Y

Assessment Unit

Assessment Unit ID: 17110014000437 **County:** King
WRIA: 10 - Puyallup-White

Basis Statement

Location ID [WHI06.3] -- In 2009, 0 of 5 sample values (0%) showed an excursion of the criteria for this waterbody;

Location ID [WHI06.3] -- In 1997, 3 of 15 samples (20.0%) showed an excursion of the criteria for this waterbody: 3 high pH excursions.

Erickson (1999) station WHI06.3 (White River (WHI06.3)) shows 5 excursions beyond the criterion out of 21 samples collected between June 1996 and Nov. 1997.

Pelletier, 1993, 3 excursions beyond the criterion out of 3 samples at RM 6.3 on 9], [18], [90, 9], [19], [90, and 10], [3], [90.

Remarks

Combined Listing: Listing ID 50841 was rolled into this listing

Data Sources

Study Id	Location Id
NMat0002	WHI06.3

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7525)

Main Listing Information

Listing ID: 7523
Waterbody Name: WHITE RIVER
Medium: Water
Parameter: Temperature
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	2
2008	2
2004	2
1998	Y
1996	N

Assessment Unit

Assessment Unit ID: 17110014005509 **County:** King
WRIA: 10 - Puyallup-White

Basis Statement

Location ID: 10C095 -- In 2008, between 7/14/2008 and 9/14/2008, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 22 of 63 days (35%); The maximum exceedance during this period was 18.09°C for the 7-day period centered on 8/14/2008 ;

{Supplemental Spawning Period}: Location ID: 10C095-- In 2008, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 3 of 10 days (30%); The maximum exceedance during this period was 14.63°C for the 7-day period centered on 9/18/2008 ;

Location ID: 10C095 -- In 2003, between 7/25/2003 and 9/14/2003, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 43 of 52 days (83%); The maximum exceedance during this period was 20.46°C for the 7-day period centered on 8/17/2003 ;

{Supplemental Spawning Period}: Location ID: 10C095 -- In 2003, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 4 of 10 days (40%); The maximum exceedance during this period was 15.39°C for the 7-day period centered on 9/20/2003 ;

Location ID: 10C095 -- In 2002, between 7/2/2002 and 9/14/2002, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 67 of 75 days (89%); The maximum exceedance during this period was 20.9°C for the 7-day period centered on 7/21/2002 ;

{Supplemental Spawning Period}: Location ID: 10C095 -- In 2002, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 21 of 33 days (64%); The maximum exceedance during this period was 15.8°C for the 7-day period centered on 6/24/2002 ;

Dept. of Ecology unpublished data from ambient monitoring station 10C095 (White R. @ R Street) shows a 7-day mean of daily maximum values of 20.9 for mid-week 21 July 2002.

Hallock (2001) Dept. of Ecology Ambient Monitoring Station 10C095 (White River @ R Street) shows 0 excursions beyond the criterion out of 12 samples collected between 1993 - 2001.

Erickson (1999) station WHI08.0 (White River (WHI08.0)) shows 2 excursions beyond the criterion out of 6 samples collected between 06/96 - 11/97.

Erickson, (1999) shows multiple excursions beyond the criterion (RM 8.0) during 1996. Review of the report shows 3 excursions out of 8 sampling days between 6/86 and 10/96.

Remarks

As a result of merging three stream reaches into a single assessment unit in 2014, this Listing has changed from Category 2 to Category 5 due to the inclusion of data formerly associated with Listing IDs 17517 and 14787.
Data for 2003 does not cover the core critical season for temperature. Maximum temperatures may be higher than observed data.
The Core Summer Salmonid Habitat temperature criterion (16°C) applies to this assessment unit. Supplemental Spawning criterion (13°C) applies from Sept. 15 - July 1.
Combined Listing: Listing IDs 17517, 14787 were rolled into this listing

Two sections of the NHD reach are on tribal lands. The listing covers the two sections of the NHD reach that are not on non-tribal lands. Only the lower portion of the reach on non-tribal lands is displayed in the map.

Data Sources

Study Id	Location Id
AMS001E	10C095
AMS004	10C095
NMat0002	10-WHT-8.5

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7523)

Main Listing Information

Listing ID: 9844
Waterbody Name: BOWMAN CREEK
Medium: Water
Parameter: Bacteria
WQI Project: Puyallup River Bacteria TMDL
Designated Use: None

Year	Category
2014	4A
2012	3
2008	3
2004	1
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110014001317 **County:** King
WRIA: 10 - Puyallup-White

Basis Statement

Location ID: [10-BOW-0.3] -- In water year 2007, 3 of 22 sample values (14%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 36.9 does not exceed the geometric mean criterion (100 cfu/100mL).

Location ID [10-BOW-0.3] -- 0 of 4 (0.0%) of samples collected in 2006 exceed the percent criterion (200 col/100mL)
Location ID [10-BOW-0.3] -- Fewer than five samples were available in 2006, therefore a geometric mean was not calculated for this period

Erickson (1999) station BOWMAN (Bowman Creek (BOWMAN)) shows the geometric mean of 23.4 does not exceed the criterion and that 0% of the samples does not exceed the percentile criterion from 6 samples collected during 1996.

Remarks

Policy 1-11 was revised in July 2012 to specify that bacteria is assessed according to water year (Oct-Sept 30) from the previous assessment period of calendar year. the water water assessment is only applied to newly assessed data. Therefore, this listing contains data assessed by both water year and calendar year.
Impairment was determined by exceedance of the percent criterion in water year(s) 2007.
This assessment unit was assigned a bacteria load allocation by the Puyallup River Watershed Fecal Coliform Total Maximum Daily Load
Changed to Cat 4A per Nuri Mathieu in 2015
Combined Listing: Listing ID 45696 was rolled into this listing

Data Sources

Study Id	Location Id
LSUL0001	10-BOW-0.3

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=9844)

Main Listing Information

Listing ID: 45737
Waterbody Name: UNNAMED CREEK (TRIB TO WHITE RIVER)
Medium: Water
Parameter: Bacteria
WQI Project: Puyallup River Bacteria TMDL
Designated Use: None

Year	Category
2014	4A
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110014015837 **County:** King
WRIA: 10 - Puyallup-White

Basis Statement

Location ID: [10-TAS-0.01] -- In water year 2007, 1 of 7 sample values (14%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 39.4 does not exceed the geometric mean criterion (100 cfu/100mL).

Location ID [10-TAS-0.01] -- 0 of 2 (0.0%) of samples collected in 2006 exceed the percent criterion (200 col/100mL)
Location ID [10-TAS-0.01] -- Fewer than five samples were available in 2006, therefore a geometric mean was not calculated for this period

Remarks

Policy 1-11 was revised in July 2012 to specify that bacteria is assessed according to water year (Oct-Sept 30) from the previous assessment period of calendar year. the water water assessment is only applied to newly assessed data. Therefore, this listing contains data assessed by both water year and calendar year.

Category determination was based on exceedance of the percent criterion in water years(s) 2007.

The bacteria impairment in this Assessment Unit is addressed by the Puyallup River Bacteria TMDL completed in 2011.

Changed to Cat 4A per Nuri Mathieu in 2015

Data Sources

Study Id	Location Id
LSUL0001	10-TAS-0.01

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=45737)

TMDL

The following links have been provided for the known TMDLs that have been identified as part of the Receiving Water Assessment:

Green River Basin:

Green River Temperature Watershed TMDL

Soos Creek Basin:

Soos Creek Multi-Parameter TMDL - Washington State Department of Ecology

Soos Creek Watershed Fecal Coliform TMDL

White River Basin:

Lower White River pH TMDL

Puyallup River Bacteria TMDL

BIOLOGIC INTEGRITY (B-IBI)

The table below describes the biological condition for identified overall score ranges as they were applied to the water quality analysis. For the purpose of this analysis, the classification of no data was added to identify areas within a basin that lack sufficient data to provide a score.

Table A-6. Range Definitions for Biological Condition Scores

Overall Score Range	Biological Condition	Description
[80, 100]	Excellent	Comparable to least disturbed reference condition. High overall diversity in taxa (mayflies, caddisflies, stoneflies, long-lived, clingers, and intolerant species specifically measured), high relative abundance of predators.
[60, 80)	Good	Diverges slightly from least disturbed condition. Absence of some long-lived and intolerant species; noticeable decline in mayflies, stoneflies, and caddisflies; the proportion of tolerant taxa is greater than the Excellent condition.
[40, 60)	Fair	Overall taxa richness is reduced, especially intolerant, long-lived, stonefly, and clinger species. The proportion of tolerant taxa is greater than the Good condition. Relative abundance of predator taxa is lower than the Good condition.
[20, 40)	Poor	Overall taxa diversity has declined. The proportion of predators and long-lived species has greatly reduced. Few stoneflies and intolerant species identified. The three most abundant taxa are shown to be dominant.
[0, 20)	Very Poor	Overall taxa diversity is very low and dominated by a few highly tolerant taxa. Mayfly, stonefly, caddisfly, clinger, long-lived, and intolerant taxa are largely absent. The relative abundance of predators is very low.

Source: King County 2021

Attachment A3

Puget Sound Stream Benthos

Row	Site Code, Location	Year, Project	Quantities												Scores										
			Taxa Richness	*Ephemeroptera Richness*	*Plecoptera Richness*	*Trichoptera Richness*	*EPT Richness*	*Clinger Richness*	*Long-Lived Richness*	*Intolerant Richness*	*Percent Dominant*	*Predator Percent*	*Tolerant Percent*	*Organisms*	*Overall Score*	*Taxa Richness*	*Ephemeroptera Richness*	*Plecoptera Richness*	*Trichoptera Richness*	*Clinger Richness*	*Long-Lived Richness*	*Intolerant Richness*	*Percent Dominant*	*Predator Percent*	*Tolerant Percent*
1	09LOW0753, Green River - Lower tributary (S 277th St.)	2021, Ambient Monitoring	44	1	3	3	7	4	4	1	0	0	0	500	33.3	5.9	0.0	2.9	2.5	0.0	2.5	1.4	6.3	3.3	8.6
2	09LOW0788, Green River- Lower tributary (0069)	2014, Ambient Monitoring	29	0	2	1	3	5	3	0	1	0	0	213	15.6	0.7	0.0	1.4	0.0	0.0	1.2	0.0	1.8	4.2	6.3
3	09MID1374, O'Grady Creek	2020, Ambient Monitoring	48	3	9	8	20	18	7	4	0	0	0	500	71.4	7.2	2.9	10.0	8.8	6.5	6.2	5.7	5.4	10.0	8.7
4	09MIL0291, Mill Creek (Auburn)	2003, Ambient Monitoring	28	2	4	10	16	10	3	1	0	0	0	500	50.2	5.7	1.4	4.3	10.0	2.9	1.2	1.4	8.6	5.5	9.0
5	09MIL0340, Mill Creek (Auburn)	2021, Ambient Monitoring	42	2	4	5	11	10	4	1	0	0	0	341	44.9	5.2	1.4	4.3	5.0	1.8	2.5	1.4	8.9	10.0	4.5
6	09MIL0390, Mill Creek (Auburn)	2021, Ambient Monitoring	41	3	5	6	14	12	4	0	0	0	0	462	52.0	4.8	2.9	5.7	6.2	2.9	2.5	0.0	7.9	10.0	9.0
7	09MIL0497, Mill Creek (Auburn)	2006, Ambient Monitoring	11	1	0	0	1	4	2	0	1	0	1	500	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
8	E2599, Mill Creek (Auburn)	2010, ESA Water Quality	32	3	4	8	15	13	5	1	1	0	0	500	50.5	7.6	2.9	4.3	8.8	4.7	3.8	1.4	7.1	3.0	7.0
9	E3099, Mill Creek (Auburn)	2005, ESA Water Quality	12	0	1	1	2	2	2	0	1	0	0	184	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	3.0	4.2
10	P584, Mill Creek (Auburn)	2009, ESA Water Quality	25	5	4	3	12	11	5	1	0	0	0	239	52.5	4.3	5.7	4.3	2.5	3.5	3.8	1.4	9.0	8.7	9.2
11	P586, Bingamon Creek	2010, ESA Water Quality	22	3	3	3	9	8	4	0	1	0	0	500	27.9	2.9	2.9	2.9	2.5	1.8	2.5	0.0	3.6	0.8	8.2
12	09LOW0406, Mullen Slough	2011, Ambient Monitoring	15	2	2	0	4	5	4	1	1	0	1	500	7.0	0.0	1.4	1.4	0.0	0.0	2.5	1.4	0.0	0.2	0.0
13	09LOW0751, Olson Creek	2020, Ambient Monitoring	53	6	7	9	22	16	7	5	0	0	0	498	82.5	9.0	7.1	8.6	10.0	5.3	6.2	7.1	10.0	9.2	10.0
14	09SOO0943, Big Soos Creek	2021, Ambient Monitoring	42	7	7	5	19	20	8	5	0	0	0	500	69.8	5.2	8.6	8.6	5.0	7.6	7.5	7.1	5.9	4.4	9.9
15	09SOO1130, Soos Creek	2020, Ambient Monitoring	37	5	6	5	16	24	9	5	1	0	0	500	48.8	3.4	5.7	7.1	5.0	10.0	8.8	7.1	0.0	1.6	0.0
16	A320 Big Soos, Soos Creek	2001, KC Historical	29	4	5	8	17	19	4	2	1	0	0	500	48.9	6.2	4.3	5.7	8.8	8.2	2.5	2.9	7.2	1.1	2.1
17	B320_MK, Soos Creek	1996, KC Historical	45	6	4	5	15	17	3	1	0	0	0	500	48.8	6.2	7.1	4.3	5.0	5.9	1.2	1.4	6.1	2.6	8.9
18	Soos Creek Near SR 58, Soos Creek	2012, TMDL Studies	48	6	5	11	22	26	9	5	0	0	0	399	82.3	7.2	7.1	5.7	10.0	10.0	8.8	7.1	8.6	7.9	9.8
19	09SOO1020, Soosette Creek	2003, Ambient Monitoring	29	6	7	3	16	16	7	5	0	0	0	500	64.3	6.2	7.1	8.6	2.5	6.5	6.2	7.1	9.5	3.7	6.8
20	09SOO1022, Soosette Creek	2021, Ambient Monitoring	39	6	4	6	16	18	6	4	0	0	0	500	63.6	4.1	7.1	4.3	6.2	6.5	5.0	5.7	6.1	10.0	8.5
21	soos06, Soosette Creek	1999, KC Historical	44	8	5	8	21	24	4	7	0	0	0	500	72.3	5.9	10.0	5.7	8.8	10.0	2.5	10.0	7.2	3.4	8.8
22	soos06a, Soosette Creek	1999, KC Historical	45	6	6	7	19	21	7	3	0	0	0	500	69.4	6.2	7.1	7.1	7.5	8.2	6.2	4.3	8.2	4.5	9.9

Legend:				
Excellent	Excellent/Good – Good	Good/Fair – Fair	Fair/Poor – Poor	Poor/Very Poor – Very Poor

Source: https://pugetsoundstreambenthos.org/Biotic-Integrity-Map.aspx

Appendix B

Watershed Characterization Analysis

PUGET SOUND WATERSHED CHARACTERIZATION PROJECT

The Washington State Department of Ecology has developed a mapping tool, the Puget Sound Watershed Characterization Project, that can be used to support stormwater management planning. The watershed characterization project mapping tool includes different categories for water flow, water quality, and fish and wildlife habitats. The Watershed Characterization tool provides color-coded maps that show the relative value of small watersheds, also known as analysis units (AU), and marine shorelines in the Puget Sound Basin. The relative value is determined by the potential importance of the area to ecological processes or values, such as water delivery, sediment delivery, or habitat/species conservation. For purposes of a map display, the analysis units are grouped into evenly distributed quartiles, which are labeled high, moderate-high, moderate and low. For this analysis the quartile rankings were converted to numeric values to sum for each ecological process value as well as for an overall analysis unit score. The quartiles were converted as follows:

- High – 4
- Moderate-high – 3
- Moderate – 2
- Low – 1

Water Flow Assessments

The water-flow model integrates two distinct sub-models, one sub-model for importance and one sub-model for degradation. For this analysis, the degradation sub-model has not been included because it evaluates the watershed in an "altered" state by considering the impact of human actions on flow processes across all landscape groups, but it fails to consider the presence of existing mitigation to offset the impacts of those actions. The importance sub-model evaluates each analysis unit in an unaltered state, based on its physical attributes of topography, soil, geology, and hydrology and without any consideration of land use changes or human modifications that may have occurred. The importance sub-model considers the following four fundamental groups of water-flow processes:

- Delivery – This group assesses the physical features that control how precipitation is delivered to the landscape. This includes the quantity of precipitation, area of forest cover, and rain on snow zones. Changes to these controls are also evaluated including percent of forest and impervious cover.
- Surface storage – This group assesses features that control the movement of water at the surface, including depressional wetlands and floodplains. Changes to storage are assessed based on the type of adjoining development and the changes to areas that decrease the capacity to store water.
- Recharge – This group assesses areas that control the infiltration of precipitation into groundwater. The model calculates the decrease in recharge based on the intensity of development.
- Discharge – This group assesses areas that control the movement of groundwater back to the surface, including the area of slope wetlands and floodplains with permeable deposits. Changes to discharge controls are evaluated based on road density, number of water wells, and type of adjacent development.

Water Quality Assessments

Export Potentials and Combined Effect

Water Quality is a key element used to inform resource management decisions when performing a watershed-level assessment. The model has five individual water quality models, each of which has an export potential sub-model and a degradation sub-model. The degradation model has not been included because it evaluates the capacity of an area to generate load pollutant constituents but does not account for existing treatment or infrastructure in place providing mitigation for the effects of the loading.

The model defines export potential as a measure of an analysis unit's relative capacity (if it were disturbed) to generate and transport contaminants to aquatic areas downstream and ultimately to Puget Sound. The export potential sub-model evaluates each analysis without any consideration of land use changes or human modifications, and it considers four fundamental groups of processes: delivery, storage, movement, and loss of a particular water quality constituent in any given watershed (Ecology 2016a). The export potential sub-model was selected for this analysis because it is analogous to the selection of the importance sub-model for water flow.

This analysis evaluated water quality using sub-models for sediments, metals, phosphorus, and nitrogen constituents. These constituents were chosen because, in excess quantities, they degrade beneficial uses of the state's aquatic ecosystems.

Sediment Sub-model

The Sediment Export Potential sub-model assesses the relative capacity of an area under natural conditions to transport sediment and to potentially act as a sink for sediment. The transport of soil particles downstream is based on the density of streams and connected wetlands and the relative area of sources of sediment (soil erosivity and landslides). The sub-model also considers the relative area that can remove sediment, which is achieved by evaluating areas with potential to act as sources and sinks of sediment. Sources of sediment can be from land clearing activities associated with land development, forestry, and agriculture.

Metals Sub-model

The Metals Export Potential sub-model assesses the relative capacity of an area to generate and transport toxic metals downstream, based on an evaluation of areas that act as sinks that can trap metals. Analysis for metals in the Watershed Characterization tool include copper and zinc. Copper can be introduced into the environment through natural sources, such as volcanic eruptions, windblown dust, and forest fires. Copper can also be introduced from copper mining activities, metal manufacturing, agricultural and domestic use of pesticides and fungicides, leather processing, and automotive brake pads. Zinc can be introduced into the environment through tire wear and from leaching of galvanized surfaces.

Areas with high export potential for metals have relatively fewer lakes, wetlands, and floodplain storage areas and less extent of soils with high organic and clay content

Phosphorus and Nitrogen Sub-models

The Phosphorous Export Potential sub-model assesses the relative capacity of an area under natural conditions to transport phosphorous downstream based on areas that act as sources and sinks of

phosphorous. The Nitrogen Export Potential sub-model assesses the relative capacity of an area to transport nitrogen downstream, based on an evaluation of areas that act as sinks that facilitate denitrification. Sources of nutrients, such as nitrogen, can be from fertilizers and animal waste. Phosphorus is present in soil and geologic materials, is typically generated by the same sources as sediments, and enters water bodies along with sediments through processes such as surface erosion, mass wasting, and in-channel erosion. The analysis gives a reduced weighting factor to each constituent so that the combined nutrient transport effect is equal to that of metal elements when scoring.

Areas with high export potential for phosphorus typically have relatively:

- Higher intensity rainfall
- Steeper topography
- More erosive soils
- Greater extent of areas subject to landslide hazards and higher stream density
- More erosive stream channels
- Fewer depressional wetlands, lakes, and floodplain storage areas to trap phosphorus
- Less extent of soils with a high clay content

Areas with high export potential for nitrogen are typically:

- Wetlands and lakes
- Riparian areas with hydric soils

Fish and Wildlife Habitats

Hydrogeomorphic Features

The Freshwater Index Components considered for this analysis were hydrogeomorphic features, which are crucial to maintaining the quality of salmonid habitats. The scoring for hydrogeomorphic features is based on the relative extent of all existing wetlands and undeveloped floodplains in the assessment unit. The Index was created using Ecology's spatial data that was refined through overlays onto land cover data layers from various sources and removing areas coincident with urban, agricultural, or developed lands (WDFW 2013). A data gap was noted in a portion of the West Lake Washington Basin for the index when performing the analysis. For hydrogeomorphic features, the index is arranged from 0 to 10, with 0 being the lowest density and 10 being the highest density, meaning that high scores have a relatively greater extent of wetlands and floodplains than other assessment units. The 0 to 10 values were normalized based on the same 1 to 4 scale used for other sub-models.

Overall Score

The overall scores were determined by summing the scores for the selected ecological processes or values, which were weighted by sub-model according to the details in Table B-1. For the basin area within City boundaries, the model AUs were clipped to the City Boundary and summed according to their relative contribution (see Table B-2). The same process was used to find scores for the watersheds, clipping according to the watershed boundaries delineated by King County (King County 2018).

Figures B-1, B-2, and B-3 show the respective sub-model inputs and model outputs for the basins withing the City boundary and for the watersheds.

Table B-1. Combined Score Weighting

Ecological Process/Value	Sub-Model	Weighting Factor	Potential Scoring Range	
			Low	High
Water Flow	Overall Importance	1.00	1.00	4.00
Water Quality	Sediment Export Potential	1.00	1.00	4.00
Water Quality	Metals Export Potential	0.50	0.5	2.00
Water Quality	Nitrogen Export Potential	0.25	0.25	1.00
Water Quality	Phosphorus Export Potential	0.25	0.25	1.00
Fish and Wildlife Habitat	Hydrogeomorphic Features	1.00	1.00	4.00
Summed Total		**4.00**	**4.00**	**16.00**

Scoring summations would be translated to quartiles as follows: High – 16; Moderate-high -12; Moderate – 8; and Low – 4

Table B-2. Puget Sound Watershed Characterization Model Outputs

Basin Name	Basin Area Within City Boundary (square miles)	Overall Score Within City Boundary	Total Watershed Area (square miles)	Overall Score of Watershed
Green River	9.24	11.70	18.10	12.06
Mill Creek	7.62	10.17	13.02	10.14
Mullen Slough	0.59	10.00	5.49	11.26
Olsen Creek	1.25	11.84	1.66	11.84
Soosette and Big Soos Creeks	1.85	10.05	27.47	9.40
White River	9.28	11.46	38.73	10.44

Source: Ecology 2016b

Stormwater Management Influence

Per Ecology's SMAP Guidance document, a receiving water basin with low stormwater management influence can be disregarded for future prioritization efforts. Ecology recommends considering both the hydrologic impact and pollutant loading impact of each receiving water basin to assess the stormwater management influence on their respective receiving waters. To summarize the hydrologic and pollutant loading impacts of each receiving water basin, a score was assigned to each based on the sub-model outputs described in the previous sections of this Appendix document.

The output from the water-flow overall importance sub-model was used to assign a hydrologic impact score to each receiving water. The model AUs were clipped to the City Boundary and the resultant water-flow scores for each AU were averaged according to their relative contribution to the corresponding receiving water basin.

Similarly, the outputs from the water-quality sub-models were used to assign a pollutant loading impact score to each receiving water. The model AUs were clipped to the City Boundary and the resultant

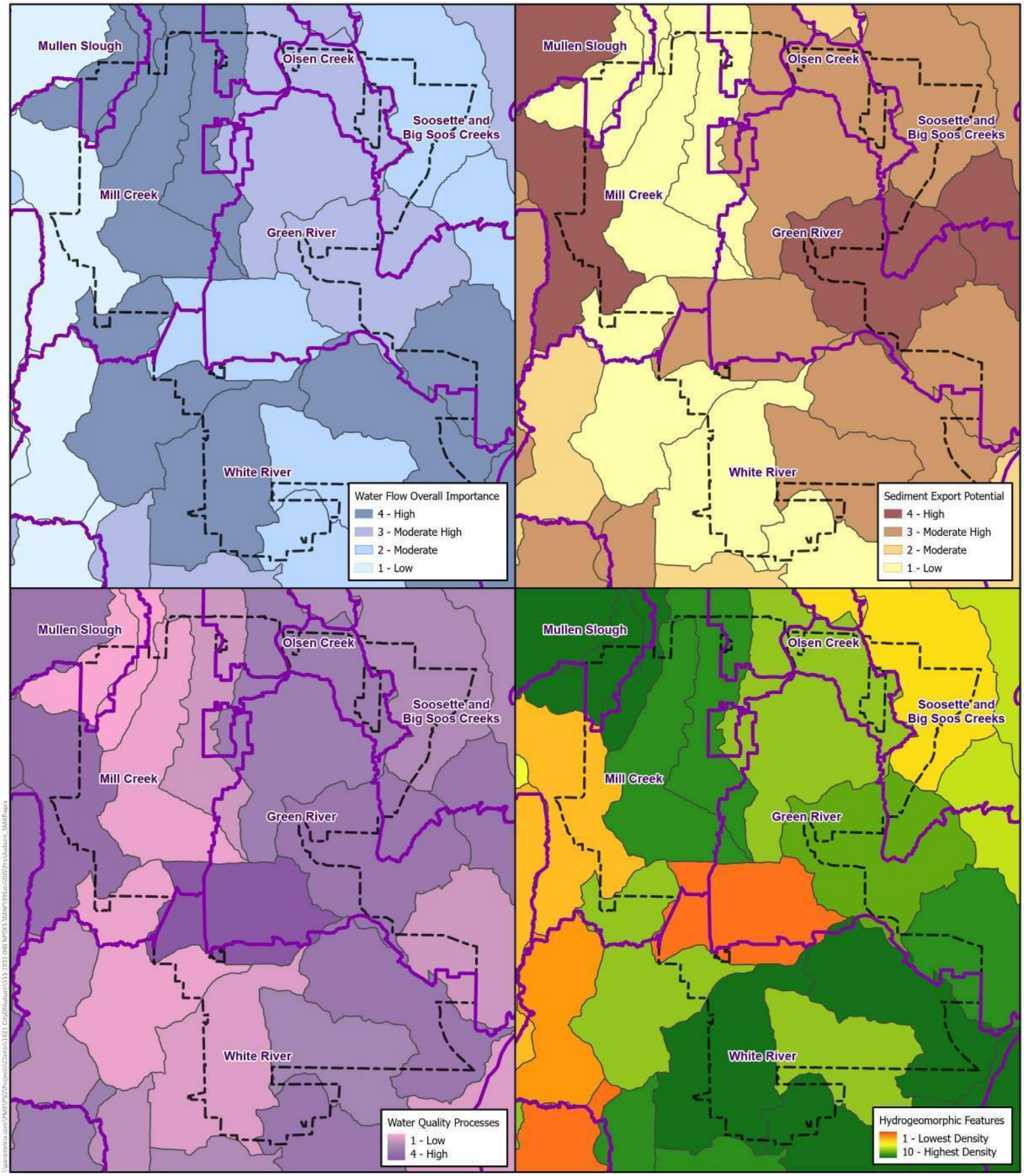
combined nutrient export potential (including metals, nitrogen, and phosphorus export potentials according to the weights assigned in Table B-1) for each AU was averaged according to their relative contribution to the corresponding receiving water basin. The same process was done for the sediment export potential. The combined nutrient export potential score and sediment export potential score for each receiving water was then averaged to assign the pollutant loading score.

Scores ranged from 1 to 4 and were rounded to the nearest whole number to obtain quartile rankings for the impact scores. A score of 1 would be representative of a receiving water basin with low hydrologic or pollutant loading impact on its respective receiving water, whereas a score of 4 would be representative of a receiving water basin with high hydrologic or pollutant loading impact on its respective receiving water. Table B-3 summarizes the resulting impact scores.

Table B-3. Hydrologic and Pollutant Loading Scores of Receiving Water Basins within City Boundary

Basin Name	Hydrologic Impact Scores	Hydrologic Impact Score Key	Pollutant Loading Impact Scores	Pollutant Loading Impact Score Key
Green River	3	Moderate-high	3	Moderate-high
Mill Creek	3	Moderate-high	2	Moderate
Mullen Slough	4	High	1	Low
Olsen Creek	3	Moderate-high	3	Moderate-high
Soosette and Big Soos Creeks	2	Moderate	3	Moderate-high
White River	3	Moderate-high	2	Moderate

Source: Ecology 2016b



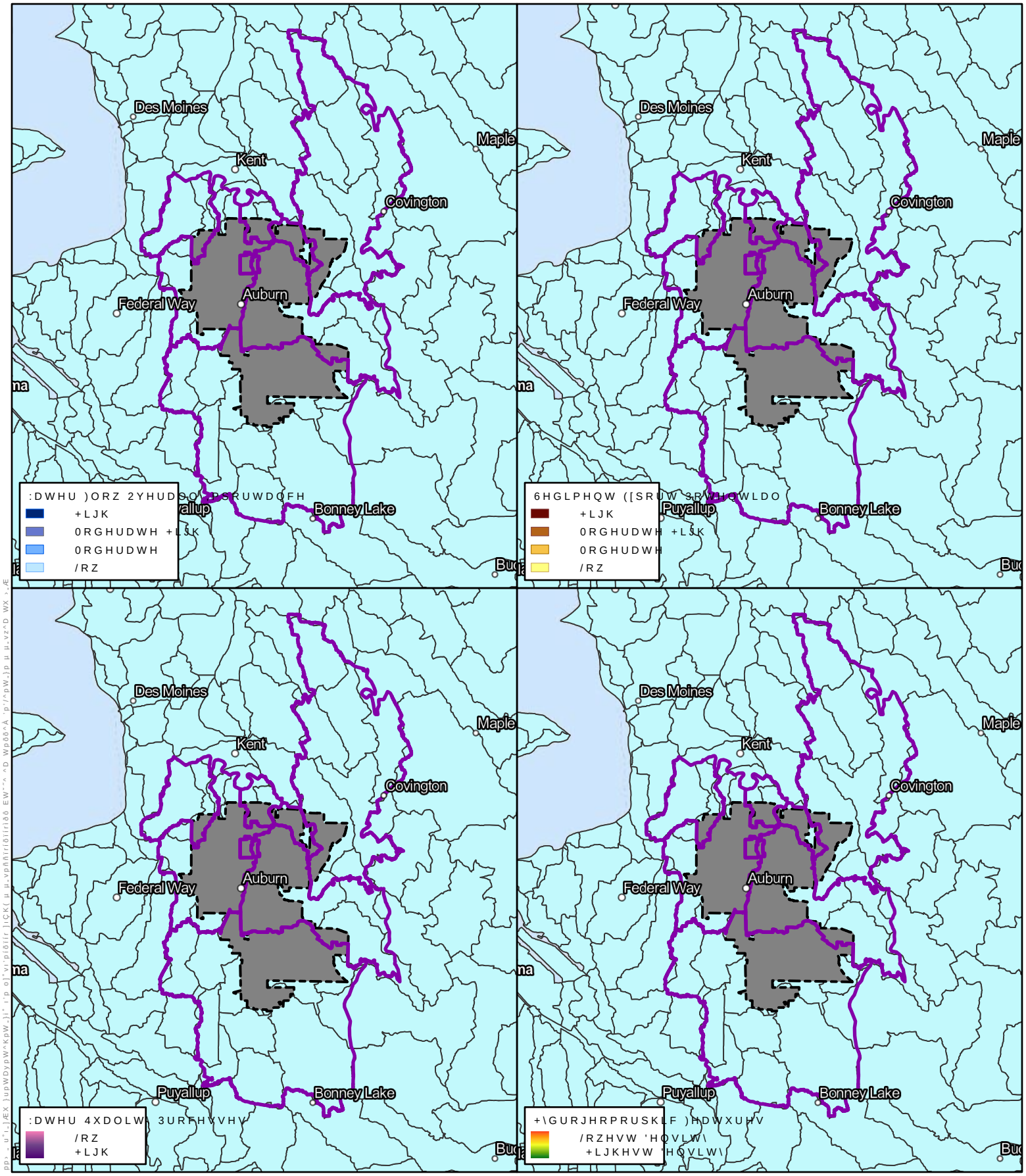
Date: 2/16/2022
Sources: City of Auburn, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Receiving Water Basin
PSWCM Boundaries
Auburn City Limits

Figure B-1 - Puget Sound Watershed Characterization Sub-Model Inputs
Auburn SMAP
Receiving Water Assessment

0 0.5 1 2 Miles

Auburn, WA



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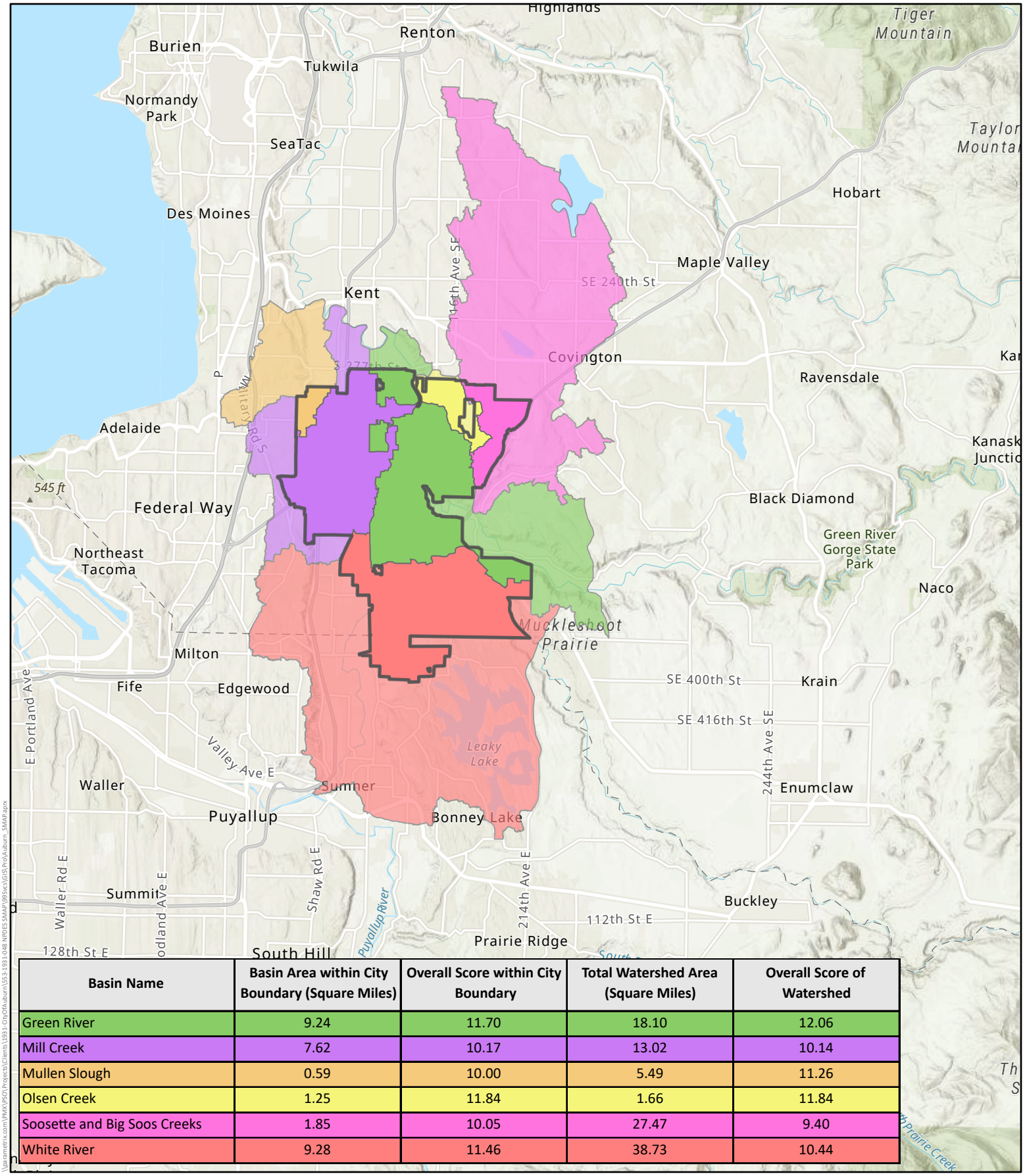

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Soosette and Big Soos Creeks	1.85	10.05	27.47	9.40
White River	9.28	11.46	38.73	10.44

Date: 2/16/2022
Sources: City of Auburn, King County, Pierce County, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Auburn City Limits

Figure B-3 - Puget Sound Watershed Characterization Model Output Summary
Auburn SMAP
Receiving Water Assessment

0 1 2 4 Miles

Auburn, WA

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Appendix C

Combined Equity Index

PUBLIC HEALTH AND THE ENVIRONMENT

The Equity Layer, or the Combined Equity Index, was developed by averaging the scores from three separate indices: a Demographic Index, an Environmental Hazard Index, and an Environmental Opportunity Index. The data for the Demographic Index and Environmental Hazard Index were sourced from the Environmental Protection Agency's (EPA's) web-mapping tool, the Environmental Justice Screening and Mapping Tool (EJSCREEN Tool) (EPA 2019). The Environmental Opportunity Index was developed by Parametrix to complement the demographic and environmental hazards-based analyses by scoring canopy cover and park/open space access using GIS data obtained from the City.

Environmental Justice Screening and Mapping Tool (EJSCREEN Tool)

The Environmental Protection Agency (EPA) has developed a web-based tool that uses national data to combine environmental and demographic indicators that can be used to support a wide range of research and policy goals. The EJSCREEN Tool supports these goals by informing an understanding of where the impacts of existing pollution may be the greatest by filling certain data gaps to ensure these areas are not overlooked so they may receive appropriate consideration, analysis, and outreach when policies are developed to protect and improve public health and the environment. EJSCREEN puts each indicator or index value in perspective by reporting the value as a percentile. A percentile in EJSCREEN indicates roughly what percent of the U.S. population lives in a block group that has a lower value (or in some cases, a tied value). Block groups are defined by the U.S. Census Bureau as statistical divisions within a census tract and generally contain between 600 and 3,000 people. This means that 100 minus the percentile tells us roughly what percent of the U.S. population has a higher value (EPA 2019). The following indicators from the EJSCREEN Tool were included for further analysis during watershed prioritization.

Demographic Index

EJSCREEN Tool focuses on demographics, using them as an indicator of potential susceptibility or vulnerability to environmental pollution and recognizing that minority, low-income, and indigenous populations have historically been subject to disproportionate burden of environmental harms or risks (EPA 2019). The Demographic Index analysis considered demographic indicators, which have been summarized in Table C-1.

Table C-1. Summary of Demographic Indicators

Indicator	Detail
Minority	The number or percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word "alone" in this case indicates that the person is of a single race, since multiracial individuals are tabulated in another category—a non-Hispanic individual who is half white and half American Indian would be counted as a minority by this definition.
Low Income	The number or percent of a block group's population in households where the household income is less than or equal to twice the federal "poverty level."
Less Than High School Level of Education	The number or percent of people aged 25 or older in a block group whose education is short of a high school diploma.
Households (interpreted as individuals) in Linguistic Isolation	The number or percent of people in a block group living in linguistically isolated households. A household in which all members aged 14 years and over speak a non-English language and also speak English less than "very well" (have difficulty with English) is linguistically isolated.
Individuals under Age 5	The number or percent of people in a block group under the age of 5.
Individuals over Age 64	The number or percent of people in a block group over the age of 64.

Source: U.S. Census Bureau 2020

Environmental Hazards Index

The Environmental Hazards Index analysis considered the following environmental indicators, which have been summarized in Table C-2. The environmental indicators in EJSCREEN quantify proximity to and the numbers of certain types of potential sources of exposure to environmental pollutants. EPA developed the indicators through a review of data availability, health disparity information, risk-ranking studies, and a variety of other sources within the federal government (EPA 2019).

Table C-2. Summary of Environmental Indicators

Medium	Indicator	Detail	Key Exposure Source
Air	NATA Air Toxics Cancer Risk	Lifetime cancer risk from inhalation of air toxics.	Most air toxics originate from transportation and industry, including motor vehicles, industrial facilities, and power plants, and people are exposed in their daily activities. In some cases, these substances react with other constituents in the atmosphere or break down to other chemicals.
Air	NATA Respiratory Hazard Index	Air toxics respiratory hazard index (ratio of exposure concentration to health-based reference concentration).	
Air	NATA Diesel PM	Diesel particulate matter level in air, $\mu g/m^3$.	
Air	Particulate Matter	$PM_{2.5}$ levels in air, $\mu g/m^3$ annual average (2016).	Common sources of $PM_{2.5}$ emissions include power plants and industrial facilities. Secondary $PM_{2.5}$ can form from gases, such as NO_x or SO_2, reacting in the atmosphere.
Air	Ozone	Ozone summer seasonal average of daily maximum 8-hour concentration in air in parts per billion (2016).	O_3 is not usually emitted directly into the air but is created at ground level by a chemical reaction between NO_x and volatile organic compounds in the presence of sunlight. These ozone precursors are emitted by motor vehicles, industrial facilities, and power plants as well as natural sources. Ground-level ozone is the primary constituent of smog.
Air/Other	Traffic Proximity and Volume	Count of vehicles (AADT) at major roads within 500 meters, divided by distance in meters (not km).	Increased exposures to ambient noise, toxic gases, and particulate matter, including diesel particulates.
Dust/Lead paint	Lead Paint Indicator	The percentage of occupied housing units built before 1960 was selected as an indicator of the likelihood of having significant lead-based paint hazards in the home.	A key source of exposure to lead is through lead paint and lead-containing dust that accumulates indoors, in homes or in other buildings where lead paint was used. Exterior structures painted with lead-based paint are also a source of ambient lead through chipping exterior paint. Elevated short-term lead dust loadings have also been observed following demolition of old buildings. Lead-based paint was banned in the U.S. by the Consumer Product Safety Commission in 1978, but lead-based paint used in housing before the ban remains a significant source of exposure to lead for children and adults.

Table C-2. Summary of Environmental Indicators (continued)

Medium	Indicator	Detail	Key Exposure Source
Waste/Air/Water	Proximity to RMP Sites	Count of RMP (potential chemical accident management plan) facilities within 5 km (or nearest one beyond 5 km), each divided by distance in km.	The primary concerns with RMP facilities are the accidental release of substances and fires or explosions. The sudden release of relatively large quantities of acutely toxic substances can cause serious health effects, including death after inhalation or dermal exposure. These effects may be prompt or may occur or persist for some time after exposure. Fires may affect neighboring areas, and the associated smoke may expose people to toxic combustion products. Explosions may cause material damage and injuries to people in neighboring areas. Local residents, as well as workers and emergency responders, may suffer severe adverse effects.
Waste/Air/Water	Proximity to TSDFs for Hazardous Waste	Count of TSDFs (hazardous waste management facilities) within 5 km (or nearest beyond 5 km), each divided by distance in km.	Volatile contaminants may enter the atmosphere and reach individuals via the inhalation route. Particularly in dry climates or seasons, contaminants on the surface of some sites can become airborne and reach people directly through inhalation or indirectly after being deposited on surfaces that people may contact. Contaminants can also enter the food chain if the wind disperses them onto land used for agriculture. Some contaminants may migrate into groundwater. People may be exposed via drinking water derived from the aquifer, through vapor intrusion into their residences, or through other routes.
Waste/Air/Water	Proximity to NPL Sites	Count of proposed and listed NPL sites within 5 km (or nearest one beyond 5 km), each divided by distance in km.	
Water	Wastewater Discharge	Toxicity-weighted stream concentrations at stream segments within 500 meters, divided by distance in km.	People may be exposed to the discharged pollutants either directly or through indirect pathways. People swimming in the downstream waters or engaging in water-based recreation may be directly exposed dermally, orally, or through inhalation of volatized substances. If the released substances reach a downstream drinking water intake, consumers of the finished waters may consume whatever portion of the substances is not removed by the drinking water utility. Some portion of the discharged materials may enter the groundwater of neighboring areas and reach people through drinking water derived from wells that draw upon that aquifer.

Source: EPA 2019

Notes: AADT = average annual daily traffic; km = kilometers; NATA = National Air Toxics Assessment; NO_x = nitrogen oxides; NPL = National Priorities List; O_3 = ozone $PM_{2.5}$ = fine particulate matter, less than 2.5 micrometers wide; RMP = Risk Management Plan; SO_2 = sulfur dioxide; TSDFs = Treatment, Storage, or Disposal Facilities; ug/m^3 = microgram per cubic meter

Environmental Opportunity Index

The Environmental Opportunity Index was developed by Parametrix to complement the analyses performed using the EJSCREEN tool in order to create a single combined score. This Index was developed by scoring canopy cover and park/open space access using GIS data obtained from the City and joining it to the existing block groups to identify areas with the greatest need or areas that could benefit the most from gaining greater access to these resources. In this index, areas with the lowest canopy cover or the least access to parks or open spaces would be identified as having the highest need.

Combined Equity Index

The Combined Equity Index Scores were derived by averaging the scores of the Demographic, Environmental Hazards, and Environmental Opportunity Indices. Each category within its respective index was assigned an equal weight when creating the index scores, and then each of the three indices was equally weighted to create the combined score. The weighting of the indicators for each index will be further developed, which may include adjustments in the prioritization phase through public engagement and stakeholder inputs to the process in order to meet the specific needs identified by the City.

Table C-3. Environmental Justice and Opportunity Index Scores

Basin Name	Demographic Index Score	Environmental Hazard Index Score	Environmental Opportunity Index Score	Combined Equity Index Score
Olsen Creek	48.5	53.4	72.2	58.0
Soosette and Big Soos Creeks	48.8	51.9	80.9	60.5
Green River	54.8	60.2	84.4	66.4
Mill Creek	59.8	69.0	86.5	71.7
Mullen Slough	51.3	62.3	81.3	64.9
White River	46.4	56.4	77.8	60.2

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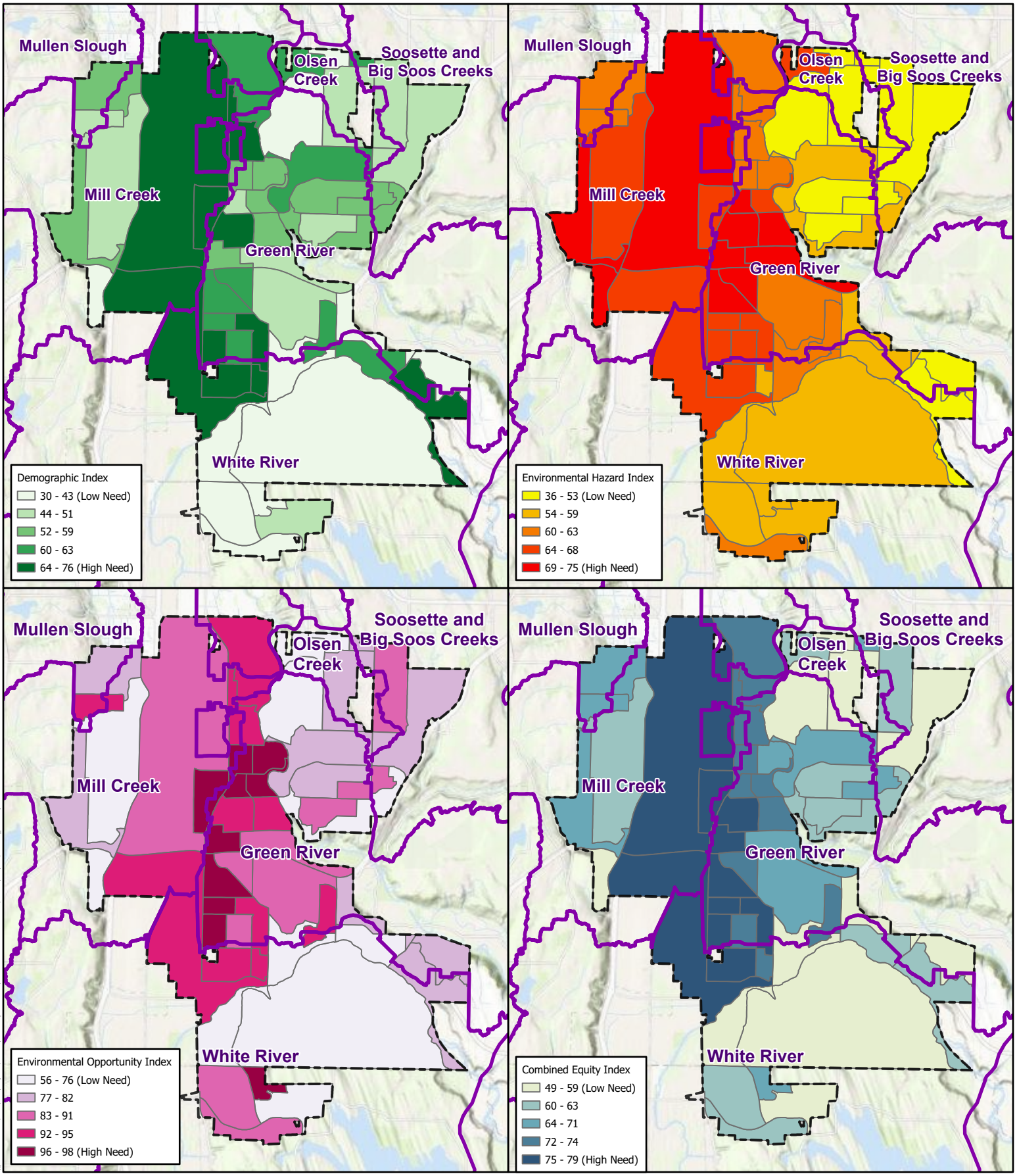

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Date: 2/16/2022
Sources: EPA (EJ Screen), City of Auburn, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Receiving Water Basin
Auburn City Limits

Figure C-1 - Environmental and Social Justice Equity Indices
Auburn SMAP
Receiving Water Assessment

0 0.5 1 2 Miles

Auburn, WA

Appendix B

Receiving Water Prioritization Technical Memorandum

Receiving Water Prioritization Methodology Stormwater Management Action Plan (SMAP)

Prepared for

City of Auburn
25 W Main Street
Auburn, WA 98001

Prepared by

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Seattle, WA 98104
T. 206.394.3700 F. 1.855.542.6353
www.parametrix.com

June 2022 | 553-1931-048

CITATION

Parametrix, 2022. Receiving Water Prioritization Methodology
Stormwater Management Action Plan (SMAP).
Prepared by Parametrix, Seattle, Washington.
June 2022.

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INTRODUCTION

Purpose

This report summarizes the Stormwater Management Action Plan (SMAP) prioritization methodology for the City of Auburn, WA (City). The SMAP basin prioritization is required by S5.C.1.d.ii of the Washington State Department of Ecology's (Ecology) National Pollutant Discharge Elimination System (NPDES) Western Washington Phase II Municipal Stormwater Permit (Ecology 2019a). Additional considerations in the development of the prioritization process were taken from the Stormwater Management Action Planning Guidance (SMAP Guide) (Ecology 2019b). The basin prioritization is the second phase of a three-step SMAP development process that started with the recently completed first phase Receiving Water Assessment (City of Auburn 2022). The prioritization is intended to create a finalist list of the City's receiving waters and drainage analysis catchments most likely to benefit from stormwater management planning and actions. In the third and final phase of the SMAP process, the City will identify stormwater management actions for one selected high-priority catchment area.

The SMAP Guide lays out expected findings and outcomes for the SMAP, which will describe the following:

- Strategic catchment area stormwater retrofits, including improvements to existing facilities and construction of new facilities
- Land management and development strategies to conserve and protect receiving waters
- Targeted and enhanced implementation of practices already part of the City's Stormwater Management Program (SWMP)

Approach

Following Ecology's SMAP Guidance (2019b) and Commerce's Building Cities in the Rain (2016) prioritization planning processes, the City's process will use applicable prioritization principles as described in the SMAP Guide and measures that are specific to the findings and circumstances in Auburn to address the objectives of the SMAP process. These principles and the recommended approach to apply each principle to a catchment is summarized in Table 1. This document will report the findings of the preliminary and secondary screenings. The final prioritization principles will be addressed in the third phase of the SMAP development process.

Table 1. Prioritization Principles and Approaches

Principle	Approach
Preliminary Screening	
Give priority to catchments based on highest and lowest impairment levels	Score basins based on existing catchment area, imperviousness, land use, and stormwater treatment conditions
Give priority to catchments where the City has a larger percentage of control of the basin	Evaluate percentage of the catchment in the City
Give priority to catchments where development threats are high due to amount of vacant and buildable land, intact undeveloped land, or estimated potential reduction in catchment future stormwater scores	Score basins based on future changes in buildable and vacant lands. Evaluate the greatest potential basin score reductions
Give priority to catchments where the City can exert greater influence	Evaluate location of the catchment within the receiving water to consider influence at different stream orders
Give priority to catchments that have high percentages of untreated roadway areas as potential basins to retrofit	Score basins based on acreage of untreated roads in the basin
Give priority to catchments that contain less than 30% impervious area and drain to a B-IBI station as potential basins to preserve	Score basins by percent impervious and evaluate any B-IBI stations in basins under the impervious area criteria
Secondary Screening	
Give priority to catchments where the City has more prior investments in stormwater controls and stream projects or where future stormwater or stream projects are planned	Map and review the location of recent stormwater capital projects and the City's near-term stormwater capital projects plan
Give priority to catchments where future capital projects are planned (e.g., transportation, drainage, flood control) or redevelopment is occurring (for opportunistic project coordination)	Map and review the location of future capital projects and planned growth centers, transit nodes, or significant redevelopment projects
Give priority to catchments where there are high levels of public interest and support, concern over water quality impacts, existing planning and restoration efforts, and past and proposed community investments with public and stakeholder partners	List basins with community support for water quality improvements and with recent stormwater and restoration projects and other benefits identified by City staff
Final Prioritization	
Give priority to catchments where the receiving waters are more impaired or require greater protection based on existing available data.	Review receiving water report and identify 2–3 priority basins due to Benthic Index of Biotic Integrity (B-IBI) scores and known monitoring or water quality characterization data
Give priority to catchments with overburdened communities, where human health impacts can be addressed and public spaces will enhance neighborhoods	Review and apply available data to select finalists from screened finalist basins
Give priority to catchments with lower levels of investment needed to meet water quality goals	Estimate required level of investment needed to meet desired protection or restoration goals
Give priority to catchments with greater action feasibility for stormwater management actions	Evaluate the level of resources needed to meet water quality goals using stormwater facility retrofits, customized SWMO actions, and land or development management actions

The City's receiving water assessment data is presented at the City's SMAP website, available online here:

https://storymaps.arcgis.com/stories/26828de0c81649988510289deb220263

PRELIMINARY SCREENING

The first phase of the prioritization method involves the preliminary scoring and ranking of the City's catchment areas (Figure 1). Basins will be screened, and potential finalists selected from the scoring process. The Geographic Information System (GIS)/spreadsheet prioritization tool known as FutureShed is used for the first phase of the screening method. FutureShed ranks each basin, from most impairment due to impervious area (lowest score) to least impairment by impervious area (highest score). An overview of the FutureShed process is shown in Figure 2. Other information, as described in following sections, is then used to complete the secondary screened list for evaluation and selection of the finalists for SMAP development.

Screening Process

The screening methodology is summarized as follows:

- The preliminary screening involves a mathematical approach to the catchments based on estimated existing and forecasted water quality and flow impacts from the catchments to the receiving waters. In the preliminary prioritization, the number of catchments is screened down to approximately 33 percent of the City's total area, or about nine catchments. Catchments with the worst scores (most impaired), catchments with the best scores (least impacted), larger catchments within the City, and catchments with the greatest score reduction due to future development are all potential finalists. In addition, catchments may be selected based on their potential for restoration or protection. To determine these catchments, basins with high percentages of roadways will be evaluated for restoration and basins with less than 30% impervious area that drain to a B-IBI station will be evaluated for protection.
- The secondary screening is a further review of the catchments by the City's Interdisciplinary Team (the cross-departmental City staff working on the SMAP development). The secondary screening considers additional qualitative factors (listed below) and accounts for public input from the community and partner stakeholders. After the secondary screening, three remaining basins will move forward to the final prioritization.
- Examples of other factors to select the screening finalists include the following:
  - Catchments where the City has more prior investments in stormwater controls and stream projects or where future stormwater or stream projects are planned
  - Catchments where future capital projects are planned (e.g., transportation, drainage, flood control) or redevelopment is occurring
  - Catchments where there are high levels of public interest and support, concern over water quality impacts, existing planning and restoration efforts, and past and proposed community investments with public and stakeholder partners
- The final prioritization considers additional qualitative factors identified in the receiving water assessment to identify the single catchment with the most feasible actions identified that will be carried forward as the City's SMAP highest-priority catchment in the next phase. Examples of other factors to select the finalists include the following:
  - Catchments where the receiving waters are more impaired or require greater protection based on existing available data

  - Catchments with overburdened communities where human health impacts can be addressed and public spaces will enhance neighborhoods.

City staff and internal project partners were engaged in many steps of the process. The review and selection team consist of the following:

- The City staff, including the Community and Planning Services departments within the Community Development Department and the Storm Drainage and Transportation teams within the Public works Department.
- Stakeholders, including the City's consultant team from Parametrix, Inc.

Additional input was solicited from the public through the SMAP website and through an online storymap with an interactive web map and survey.

Input Data

FutureShed uses the following inputs from the City's receiving water assessment:

- Drainage Catchment Areas: The receiving water assessment basins were sub-delineated into smaller catchment areas based on topography and the City drainage network. The catchment areas vary but are generally about 1 square mile.
- Land Cover: As discussed in the City's receiving water assessment, land cover type has a strong influence on stormwater runoff and downstream impacts to wildlife habitat and water quality. For FutureShed analysis, the City's land cover layers are classified into one of six different categories:
    1. Forest (contiguous stands of trees larger than 1 acre)
    2. Trees (all other mapped trees)
    3. Grass or Landscape
    4. Non-pollutant generating impervious surface (NPGIS)
    5. Parking
    6. Roads
- Existing Stormwater Management: The stormwater management coverage for the City is based first on the installation dates of mapped facilities (see web map Detention Facility and Water Quality Facility layers). Additional existing stormwater management coverage is based on parcel development dates. The development dates corresponding to the mapped facilities and parcel permit dates are compared with historical dates of stormwater management thresholds adopted by the City to classify facilities as vintage or current. The SMAP prioritization is intended to serve as high-level planning; and for these purposes the historical stormwater management milestones are based on the following:
    - Water Quality
        - No Treatment: Before the vintage threshold (<1991)
        - Vintage Threshold: Year when basic treatment started to be required for most projects (1991-2011)
        - Current Threshold: Year when enhanced treatment was required for a broader range of projects (2011-Current)

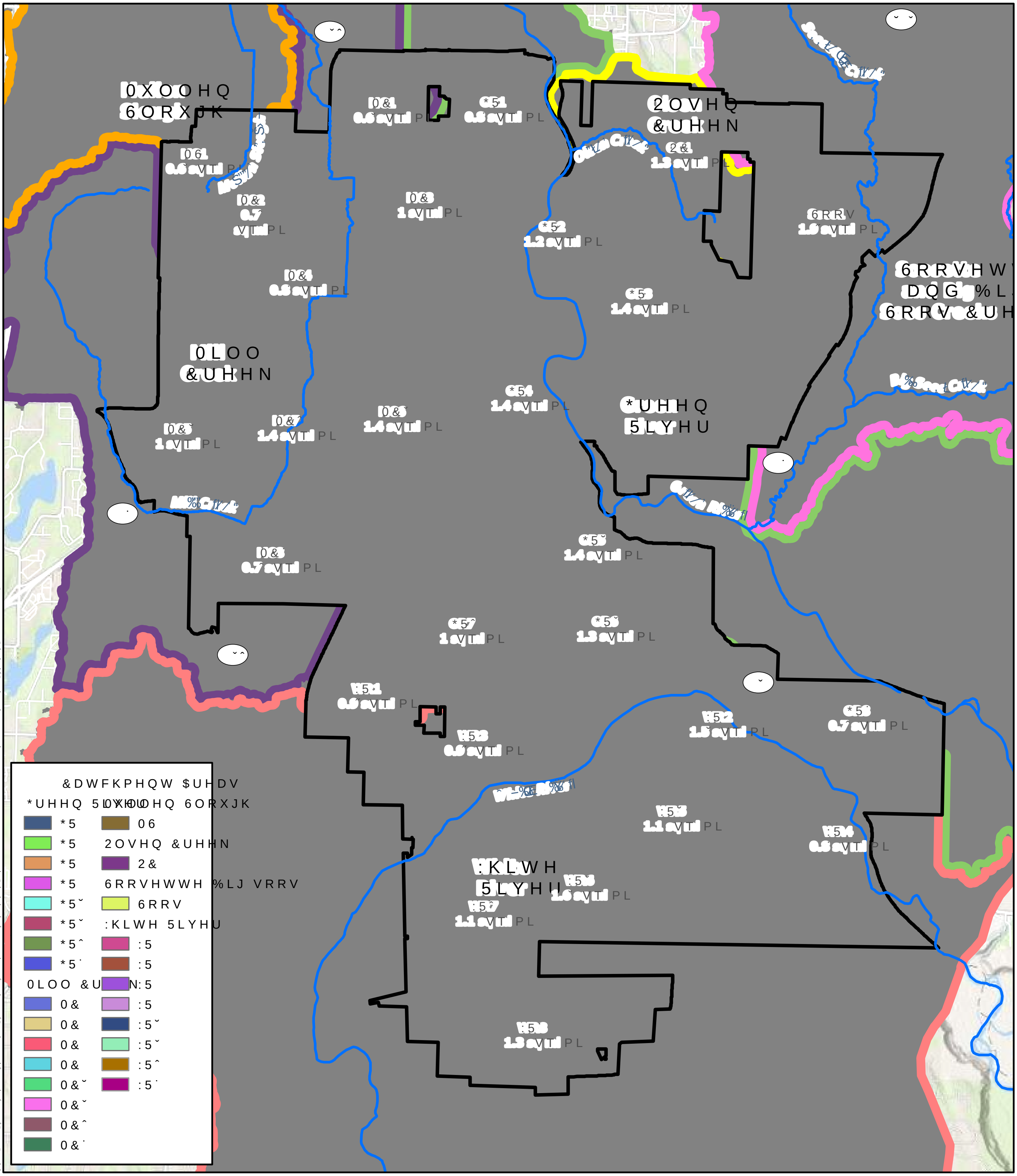
- Flow Control
  - No Treatment: Before the vintage threshold (<1991)
  - Vintage Threshold: Year when facilities were sized to target existing conditions with a peak flow control standard (1991-2011)
  - Current Threshold: Year when facilities were sized to target presettlement (typically forested) conditions with a flow duration standard. (2011-Current)

In addition to the inputs for evaluation of existing conditions, a consideration of future conditions is included in the objective review for prioritization:

- Buildable and Vacant Lands: This data is used to forecast areas of projected or targeted growth and estimate the stormwater management upgrades that would be triggered by future property development with the assumption that stormwater control design standards would be implemented where applicable. For use in FutureShed, the City's buildable lands and vacant lands GIS data is categorized as either vacant, underdeveloped, or built.
- Road Retrofit: This data is used to estimate the effect retrofitting all roads within a basin to comply with current stormwater management treatment standards would have on the water quality and flow control.
- Forest Preservation: This data is used to determine which basins would benefit the most in the future in terms of water quality and flow control from preserving currently forested land.

Analysis

The preliminary prioritization is conducted using the GIS/spreadsheet-based FutureShed basin forecasting tool. FutureShed calculates, weights, and compares existing and future composite scores for flow and water quality pressures on receiving waters from each catchment. The baseline scoring process and future forecasting are described below.



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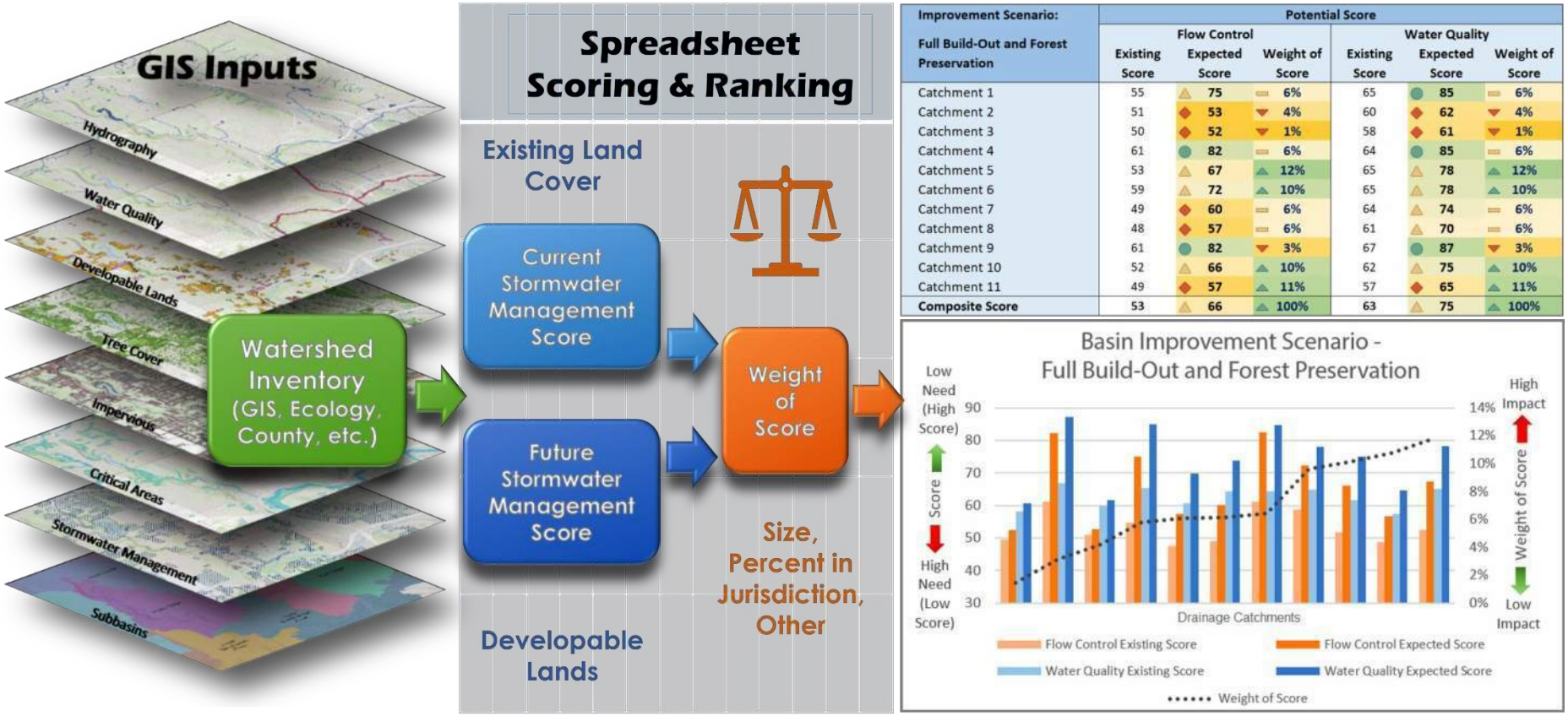


Figure 2. FutureShed Process

Baseline Catchment Scoring

Using GIS data inputs in a spreadsheet, FutureShed quantifies and rates individual land cover types and their associated runoff characteristics, then calculates a comparative score to represent the effect of water quality treatment and flow control on that runoff. The composite score of managed runoff from each land cover type within a catchment area is then calculated to characterize the influence of that catchment's runoff on its respective receiving water. Through these comparative estimates, FutureShed allows the City to approximate hydrologic and pollutant loading impacts for current and future land use on a scale that is applicable to long-range watershed and land use planning.

The stormwater management scores are assigned as *no management (untreated or uncontrolled)*, *vintage*, and *current standards* based on land cover type as shown in Tables 2 and 3. Scores are based on professional judgment using industry-based knowledge of runoff characteristics and are not intended to reflect a definitive stormwater benefit. Instead, they are intended to show a comparative magnitude between different control types for runoff from different land covers.

Table 2. FutureShed Water Quality Treatment Scores

	Water Quality Treatment		
Land Cover	**Untreated**	**Vintage**	**Current**
1.1 Forest	100	100	100
1.2 Trees	100	100	100
1.3 Grass or Landscape	50	70	80
2.1 NPGIS	40	60	70
2.2 Parking	10	60	70
2.3 Roads	0	30	70

Source: Scores are based on professional judgment and are not intended to reflect a definitive stormwater benefit; they are intended to show the magnitude between different control types for runoff from different land covers.
NPGIS = Non-Pollutant Generating Impervious Surface

Table 3. FutureShed Flow Control Scores

	Flow Control		
Land Cover	**Uncontrolled**	**Vintage**	**Current**
1.1 Forest	100	100	100
1.2 Trees	90	90	90
1.3 Grass or Landscape	60	80	90
2.1 NPGIS	0	70	80
2.2 Parking	0	70	80
2.3 Roads	0	70	80

Source: Scores are based on professional judgment and are not intended to reflect a definitive stormwater benefit; they are intended to show the magnitude between different control types for runoff from different land covers.
NPGIS = Non-Pollutant Generating Impervious Surface

Weight of Scores

For flow control, a high score reflects a low hydrologic response with less runoff leaving the parcel, while a low score would be indicative of a high hydrologic response and more runoff from the parcel. For water quality treatment, a high score corresponds to less impacted water quality, while a low score would indicate a catchment that may be a source of pollutants contributing poor water quality from the catchment discharge. The weight of the score can be based on different factors but most typically reflects the catchment area located within the City boundary. This weighting helps to prioritize basins

where the City has potentially greater influence on receiving waters with direct stormwater management actions that are within the City's geographic control and have greater impacts due to development that has no stormwater controls.

Future Forecast

FutureShed is then used to forecast expected stormwater management coverage based on future development and redevelopment scenarios, with the assumption that stormwater control design standards would be implemented on development as required by City codes. The amount of future development is predicted based on the City's buildable lands data. For preliminary prioritization and comparison purposes, parcels identified as buildable are assigned a water quality score of 70 in the future and a flow control score of 80. Again, these scores are not definitive classifications of future runoff but are used to compare the magnitudes of impact from different scenarios. The City will consider the following scenarios for comparison:

- "All Buildable" – Assumes all vacant and underutilized parcels would be developed in the future. This scenario updates parcels, but not adjacent roads.
- "Road Retro" – Assumes all roads would be updated and retrofit to meet current flow-control and water quality standards. This scenario does not update parcels.
- "Forest Preservation" – Assumes all forested areas will remain forested and will not be developed upon.

The results of the FutureShed output for Auburn is shown in Figures 3 and 4. The catchment area map with the drainage analysis units are shown on Figure 1.

Results of Catchment Scoring Screen

As described above, FutureShed is a screening tool used to assist in the preliminary screening process to select potential finalist catchment areas for consideration in the secondary screening process and the final prioritization. About 33 percent (nine) of the basins in the City will be included in this screened list.

The existing water quality and flow control FutureShed scores along with the percent impervious and percent built of each catchment in within the City are shown in Figure 3. These scores are ordered from highest weight of City influence (most area within the City) to lowest weight of City influence (least area within the City).

The existing water quality and flow control FutureShed scores are also shown with the composite scores, catchment summary information, and future scenario values in Figure 4. The catchment summary includes information about the size of each basin relative to the City; total, treated, and untreated impervious percentages; and the acreage of untreated roads. The future scenario columns contain the change in score from the composite score when the future scenario is applied. For example, basin GR7 increases from a composite score of 40 to 44 when all buildable lands are built out. Descriptions of the future scenarios can be found above in the "Future Forecast" section. As described, these values are not intended to reflect a definite stormwater benefit but are meant to provide a comparison of stormwater actions on the catchments.

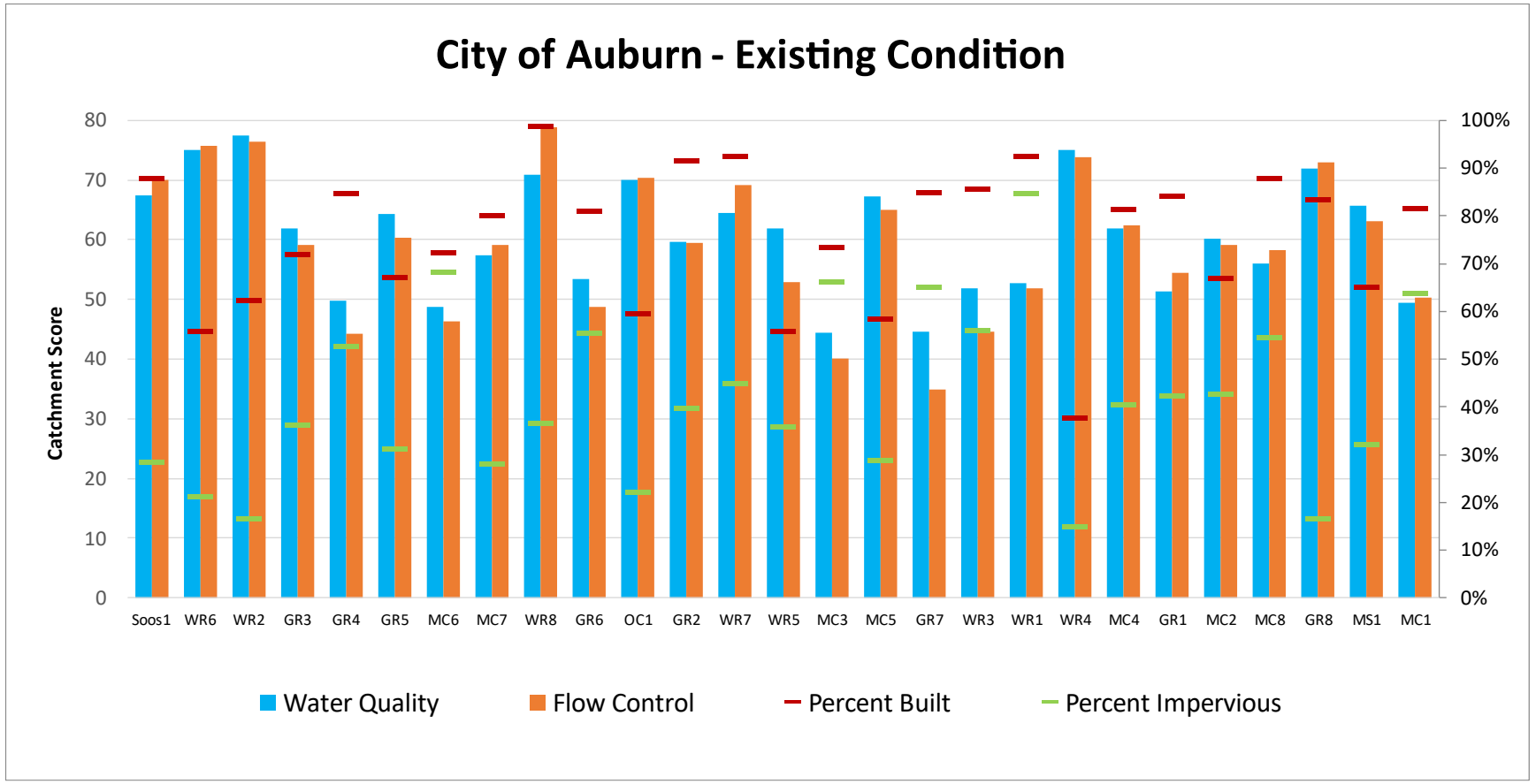


Figure 3. FutureShed Output Graph

	Catchment Summary					Current Score			Future Scenarios		
						Existing Treated Score					
Basin	Percent of City	Percent Impervious	Treated Impervious	Untreated Impervious	Untreated Roads (Acres)	Water Quality	Flow Control	Composite	All Buildable	Road Retro	Forest Preserve
GR7	3.4%	65%	14%	51%	76	45	35	40	4	9	0
MC3	3.4%	66%	21%	45%	46	44	40	42	10	6	3
GR4	4.8%	53%	12%	41%	98	50	44	47	2	9	5
MC6	4.7%	68%	33%	35%	79	49	46	48	6	8	2
WR3	3.1%	56%	16%	41%	47	52	45	48	4	7	2
MC1	2.0%	64%	35%	29%	14	49	50	50	9	5	4
GR6	4.4%	56%	18%	37%	83	53	49	51	1	8	6
WR1	3.0%	85%	56%	29%	14	53	52	52	3	3	1
GR1	2.7%	42%	20%	22%	24	51	54	53	6	6	2
MC8	2.3%	55%	32%	23%	45	56	58	57	1	10	9
WR5	3.6%	36%	1%	34%	5	62	53	57	-1	4	33
MC7	4.6%	28%	8%	20%	64	57	59	58	2	7	8
GR2	3.9%	40%	17%	23%	30	60	60	60	3	5	3
MC2	2.4%	43%	18%	25%	29	60	59	60	1	6	13
GR3	4.8%	36%	10%	27%	66	62	59	61	1	7	14
MC4	2.8%	41%	19%	22%	34	62	62	62	4	5	3
GR5	4.8%	31%	6%	26%	52	64	60	62	3	5	12
MS1	2.0%	32%	9%	24%	26	66	63	64	-3	6	23
MC5	3.4%	29%	7%	22%	42	67	65	66	0	6	22
WR7	3.7%	45%	32%	13%	35	65	69	67	0	10	7
Soos1	6.3%	28%	17%	12%	41	67	70	69	1	4	3
OC1	4.2%	22%	7%	15%	31	70	70	70	-1	4	22
GR8	2.3%	17%	6%	11%	8	72	73	72	-2	3	15
WR4	2.8%	15%	2%	13%	13	75	74	74	-3	4	45
WR8	4.5%	37%	35%	2%	3	71	79	75	1	6	2
WR6	5.3%	21%	10%	12%	33	75	76	75	-3	4	31
WR2	4.9%	17%	5%	12%	16	77	76	77	0	4	25
Total	100%	46%	14%	28%	42	58	56	61	3	6	10

Expected Score	Need
25	High
40	Need
55	↕
70	
85	Low
100	Need

Untreated Impervious	Development
100%	High
80%	Impact
60%	↕
40%	
20%	Low
0%	Impact

Treated Impervious	Development
100%	Low
80%	Impact
60%	↕
40%	
20%	High
0%	Impact

Figure 4. FutureShed Output Table

SECONDARY SCREENING AND FINAL PRIORITIZATION

The secondary screening will result in a short list of higher-priority catchments selected for the scoring and measurable characteristics described above. Additional catchments will be added that address other considerations, such as other stormwater projects (proposed and completed), growth areas and capital projects, community preferences, or the water quality considerations described in the previous section that the City wishes to consider separately from or in addition to the FutureShed scoring or other elements outlined in the SMAP Guide. The review of additional factors may add one or two catchment areas. The Interdisciplinary Team will evaluate City protection and restoration goals for each candidate catchment. A summary description of all factors considered are described below.

Secondary Screening Factors

Additional considerations for the catchment finalists for selection may include the following:

Identified Related Restoration or Improvement Project Areas: Catchment areas where regional rehabilitation efforts (such as salmon recovery plans, stream restoration, watershed action plans, and regional flooding solutions) are focused or where receiving waters have been identified as important will be considered for higher-priority ranking.

Identified Capital Improvement Projects: Catchment areas where other proposed near-term or recently completed capital projects are located will be considered for higher-priority ranking. The intent is to opportunistically add on to projects to take advantage of multi-benefit efficiencies and continue to advance the objectives of recently constructed projects that improve or enhance stormwater in a specific catchment or watershed.

Other Department Planning: Citywide and project-specific plans from other City departments will be considered. For example, growth management planning, growth center or area redevelopment proposals, transit-oriented development, land conservation, or open space and parks planning can benefit from coordinated efforts. The City has identified any key or extensive special planning areas for sole consideration as a screened basin.

Public Input: Public comments recorded through the online survey and web map comments will be considered during the prioritization, as applicable. Additional factors could include political support in an area; active public groups, such as “Friends of” organizations; long-term public cleanup or volunteer planting or vegetation management areas; and ongoing basin planning efforts with broad public support.

Other factors, such as public health and over-burdened communities, the water quality analysis, the level of investment required, and action feasibility will be applied to the secondary screening finalists for selection of the proposed SMAP basins.

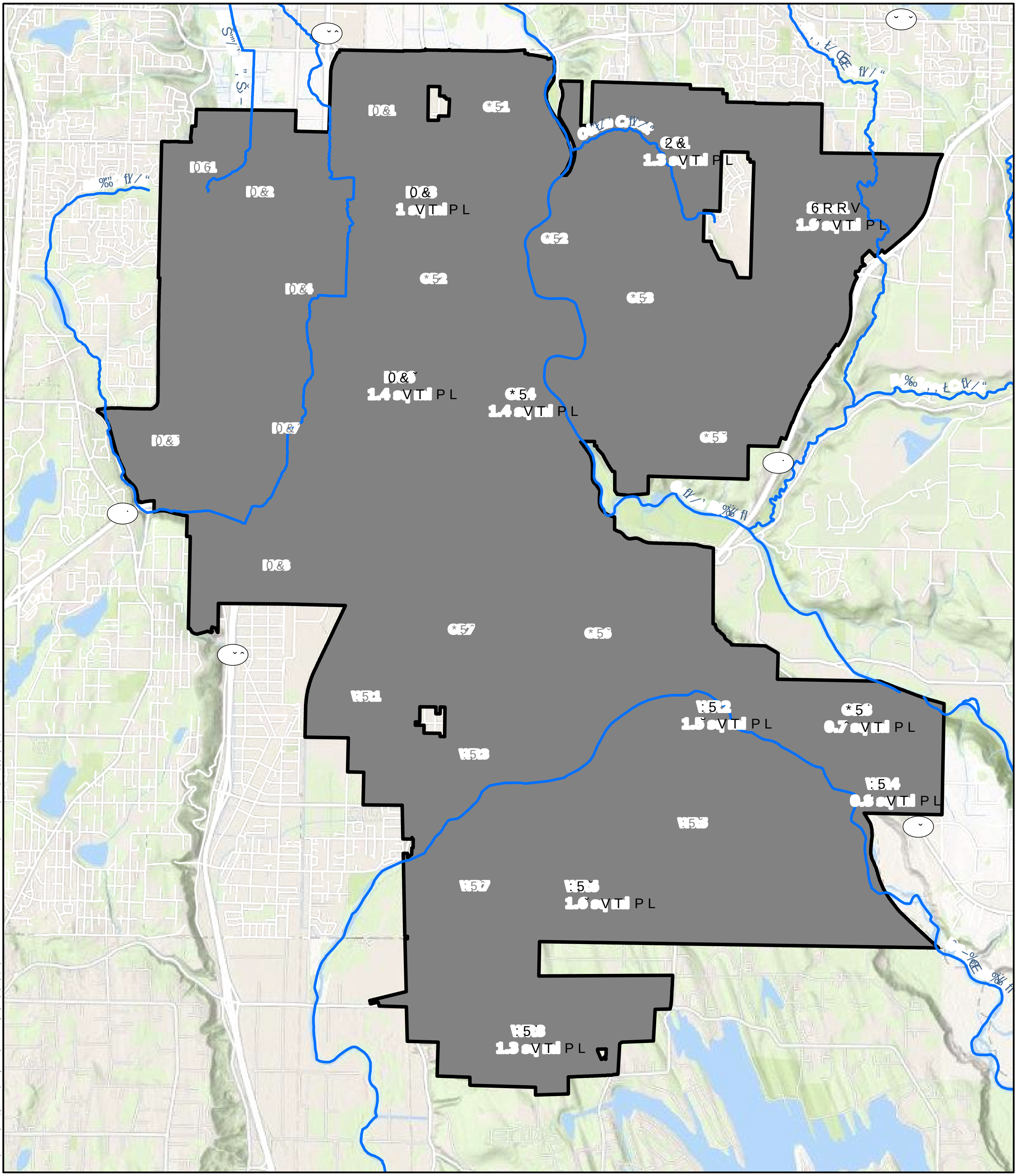
Summary of Finalists

The results of the preliminary screening are summarized in Table 4.

Table 4. Preliminary Screening Results

	Futureshed Results							
Basin	Lowest Score (Most Impaired)	Highest Score (Least Impaired)	Largest Area in the City	High Development Threat	Position in the City	Untreated Roads	Less than 30% and Draining to a B-IBI Station	Total
GR1								-
GR2								-
GR3			X					1
GR4	X		X					2
GR5								-
GR6						X		1
GR7	X							1
GR8		X		X				2
MC1								-
MC2								-
MC3	X							1
MC4								-
MC5							X	1
MC6	X					X		2
MC7								-
MC8								-
MS1				X				1
OC1				X	X		X	3
Soos1			X		X	X	X	4
WR1								-
WR2		X	X					2
WR3	X							1
WR4		X		X				2
WR5				X				1
WR6		X	X	X	X			4
WR7						X		1
WR8		X				X		2

From the preliminary screening, basins GR4, GR8, MC6, OC1, Soos1, WR2, WR4, WR6, and WR8 will move on to the next screening (Figure 5). In the stakeholder meeting, it was requested that MC3 be carried into the next prioritization due to identified stormwater needs within the basin and a high volume of prior stormwater investments.



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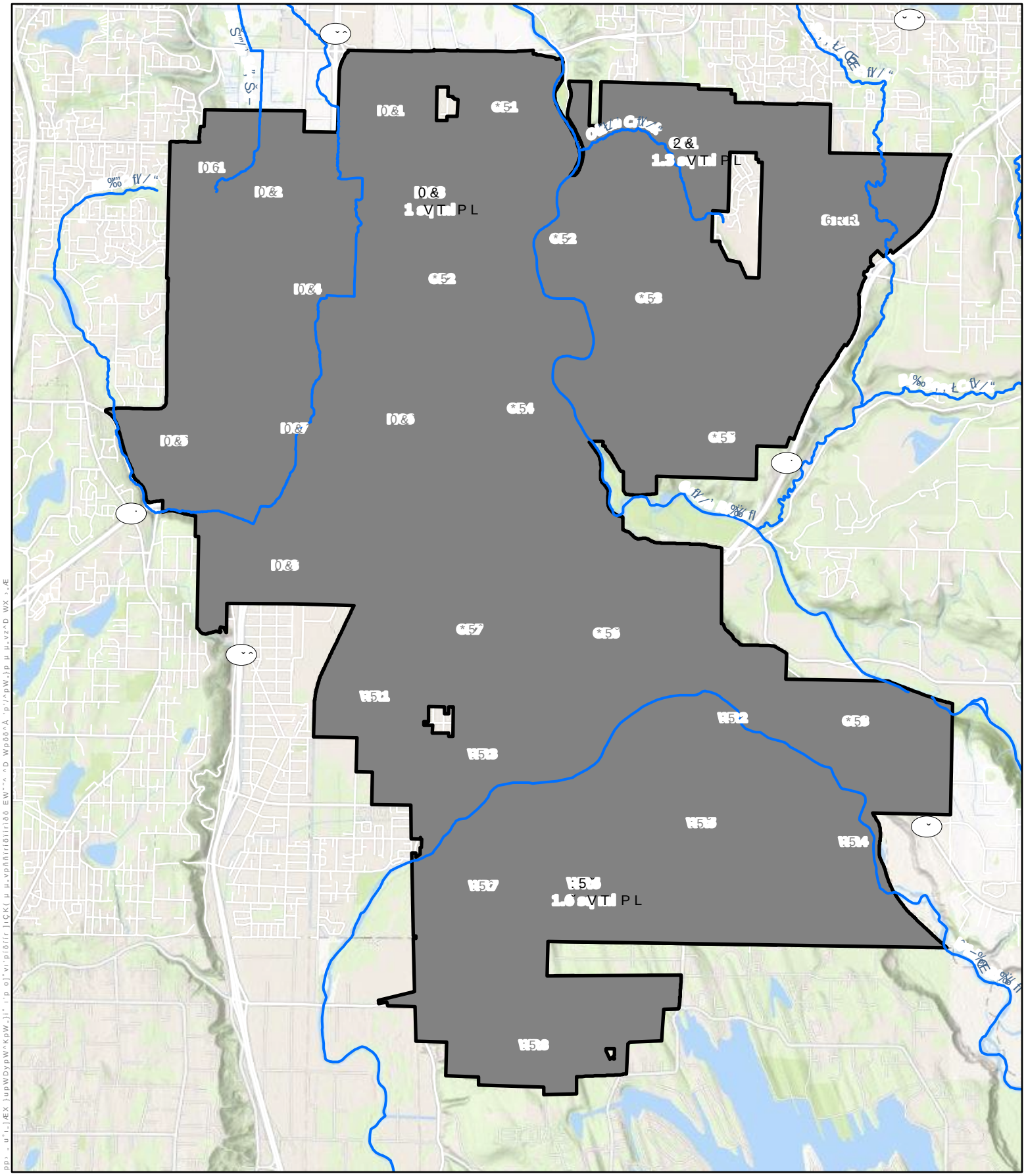
The results of the secondary screening are summarized in Table 5. Stakeholder input is weighted to ensure stakeholder input and projects have the same influence.

Table 5. Secondary Screening Results

	Other Factors				
Basin	**Prior Stormwater Investments**	**Future Stormwater Projects**	**All CIP Projects**	**Stakeholder Input**	**Total**
GR4	X		X		**2**
GR8					**-**
MC3	X			XXX	**4**
MC6	X		X		**2**
OC1				XXX	**3**
Soos1			X		**1**
WR2					**-**
WR4					**-**
WR6				XXX	**3**
WR8					**-**

From the secondary screening, MC3, OC1, and WR6 will move on to the final prioritization (Figure 6).



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NEXT STEPS

In the third and final phase of the SMAP process, the City will consider the final screening factors (public health, receiving water analysis, level of investment, and action feasibility) and begin to assess and identify stormwater management actions for the three remaining high-priority catchment areas.

Public Health

Environmental and socioeconomic stressors may act cumulatively to affect health and the environment and contribute to persistent environmental health disparities (leading to overburdened communities), as discussed previously in the City's receiving water assessment. The environmental justice and opportunity scoring will be considered as part of the priority basin selection. Catchment areas with overburdened communities where water quality issues and human health impacts are intermingled and have potential for some improvement through stormwater management will be considered for higher-priority ranking.

Receiving Water Analysis

In the prioritization process, water quality information gathered as part of the receiving water assessment were reviewed to consider the quality of water downstream from a catchment area. Information considered previously includes physiochemical and biological data as well as whether a receiving water has been listed on the 303(d) list for an impairment. Catchment areas' receiving water condition or impairment were considered as factors for higher-priority ranking. These are receiving waters expected to benefit as a result of stormwater management actions. In addition, receiving waters with B-IBI impairments will be considered for higher-priority ranking because the change in B-BIBI scores will be a good measure of seeing the outcomes of catchment area actions. Catchment areas with an impaired receiving water with current or future TMDL requirements were given lower-priority ranking or (as stated in the SMAP Guide) scientific justification. Modeling documentation for these catchment areas would need to be provided showing how additional investments would go above and beyond the current/expected TMDL requirements.

The final prioritization process will evaluate the screened short list of catchment areas and associated available information on water quality conditions. These data will be considered as water quality indicators that would suggest catchments to be included as finalists in the action planning list.

Level of Investment

The SMAP guidance suggests that one of the final criteria for selection of finalists for the action plan is to consider the "level of investment likely to meet water quality goals." In general, this would be primarily the capital project elements that would be constructed to retrofit untreated areas to bring them into alignment with existing stormwater management approaches that, in conjunction with the policies and land use planning, would lead to the desired protection and restoration goals. Ideally, if the approach is to select the basin based solely on the relative cost and benefit of the investments, a detailed approach to assess the "maximum extent practical" or AKART would be needed. However, there are other factors to consider, such as public health and the condition of the receiving waters, that should be more influential, provided the investment level is reasonably comparable between screened or prioritized catchments. Consequently, a method to provide a general weighting for comparing catchments is needed.

Action Feasibility

During the final prioritization, the Interdisciplinary Team will evaluate the catchments based on the factors listed above in combinations decided upon by the team. The final selection of the priority catchment will be made based on implementability and feasibility to execute the proposed actions in the catchment. The City will evaluate the relative level of resources needed to meet protection and restoration goals using the three strategic SMAP elements: stormwater facility retrofits, customized SWMP actions, and land or development management actions. As previously discussed, the City will apply the action feasibility approach to the two or three selected catchments. The final selection of a high-priority catchment(s) for SMAP development is described below.

Stormwater Management Actions

The stormwater management actions may consist of facility retrofits, land management and development strategies to benefit water quality, and targeted and enhanced implementation of practices already part of the City's Permit compliance program. In identifying stormwater management actions, the City will consider the following questions (see SMAP Guide for additional background):

- What combination of additional stormwater management actions will most effectively reduce current and future loadings?
- Are substantial non-stormwater management actions needed to address the impairment?

Additional screening factors that will be considered during the stormwater management action selection will include the following:

- Physical Geography: Physical geography provides information on how water travels throughout a catchment area before reaching a receiving water. Soils play an important role in determining how much water can be infiltrated before runoff occurs. Runoff can amplify the effects of erosion and pick up sediment and pollutants. Untreated runoff will deposit any sediment or pollutants into receiving waters downstream. Physical geography within a catchment area can be restrictive regarding the types of stormwater management practices that can be implemented and may be important for consideration.
- Cultural Resources: The five step Cultural Resources Review process defined by Ecology (Ecology 2021) will be considered, if applicable, during the stormwater management action selection phase. To do so, the City may review the training provided by Ecology, complete a cultural resource review form, and also submit an inadvertent discovery plan (IDP) to Ecology for projects that would involve or could result in ground disturbance. Projects that involve ground disturbance, such as stormwater facility retrofits, are likely to be included in the SMAP. The City would coordinate with Ecology, tribes, Department of Archaeology and Historic Preservation, and other stakeholders to prioritize ground disturbing projects.

The City will then select from the three catchments to identify the catchment where the most feasible actions could be implemented, thus identifying the City's SMAP high-priority catchment and develop the action plan.

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Appendix C

MODA, Cost Benefit Analysis, and Roadway Treatment Analysis

Appendix C – MODA

To determine the order of implementation for the capital improvement projects, the Utility team at the City of Auburn worked with consultant Parametrix to perform a multi objective decision analysis (MODA).

Below are the names and titles of those who participated in the Auburn Olson Creek Stormwater Management Action Plan Projects meeting held with Public Works leaders to decide which retrofit projects to move ahead with in the plan:

Tim Carlaw – Storm Drainage Engineer

Chris Thorn – Water Quality Programs Coordinator

Michael Murray – Associate Storm Drainage Engineer

MODA is a process used to help make decisions on complex issues involving multiple criteria and multiple invested parties. Through the MODA process, the City was able to consider and weigh certain factors while evaluating each alternative to help decide on a recommendation. The MODA process the City followed is as follows:

1. Criteria
   - Discuss and agree on evaluation criteria
2. Weighting
   - Determine relative importance of each criterion and assign corresponding weights
3. Rating
   - Rate each alternative for each weighted factor
4. Results
   - Discuss outcomes and evaluate results

Criteria

The criteria were chosen after reviewing SMAP requirements, typical capital improvement project considerations, and environmental impacts. The criteria chosen were:

- **Structural Stormwater Control (SSC) Points** – refers to a method of assigning points to stormwater projects based on their potential to prevent or reduce impacts to waters of the state. This method was outlined by the Washington State Department of Ecology for all Phase I Municipal Stormwater permittees. Projects with greater SSC point potential were given higher scores.
- **Benefit to Basin** – the percentage of the Olson Creek basin impervious area treated by the project and type of treatment.

- **Uncertainty** – perceived risks to project timeline and cost.
- **Maintenance** – difficulty of upkeeping each site. The score is based on maintenance difficulty or frequency, costs of maintaining similar facilities on an annual basis.

Weighting

Once all relevant criteria were determined, each category was assigned a weight on a scale of 1 to 10 to determine its relative importance. Uncertainty was determined to hold the highest importance to help ensure projects are readily implementable in the short term. All criteria weights can be found in Table C-1.

Rating

Each alternative was then assigned a rating for each criterion relative to each other.

Results

Once all the alternatives were rated, the rating factors for each alternative were multiplied with the weights of each criterion to determine the points earned by each project in a given category. These points were then summed to produce the Total Weighted Criteria Points for each project. The Total Weighted Criteria Points help inform which project provides the overall highest **benefit** based on the criteria. The MODA analysis is shown in Table C-1.

Table C-1. Proposed Alternatives for SMAP

Projects		Ridge at Willow Park Tr. C		Ridge at Willow Park Tr. B		Vintage Hills		SE 287th St		124th Ave SE and SE 307th Pl		124th Ave SE and SE 302nd Pl		124th Ave SE and SE 293rd St		SE 284th St and 109th Ave SE		SE 284th St West		SE 284th St East		SE 284th St	
Criteria	*Weight*	*Rating*	*Points*	*Rating*	*Points*	*Rating*	*Points*	*Rating*	*Points*	*Rating*	*Points*	*Rating*	*Points*	*Rating*	*Points*	*Rating*	*Points*	*Rating*	*Points*	*Rating*	*Points*	*Rating*	*Points*
SSC Points	4	5	20	9	36	4	16	6	24	5	20	3	12	8	32	10	40	2	8	1	4	7	28
Benefit to Basin	1	3	3	3	3	1	1	8	8	7	7	6	6	10	10	5	5	4	4	4	4	9	9
Uncertainty	10	1	10	1	10	3	30	5	50	5	50	5	50	5	50	10	100	10	100	10	100	5	50
Maintenance	7	10	70	9	63	10	70	5	35	5	35	5	35	5	35	1	7	2	14	2	14	5	35
Total Weighted Criteria Points:	22	103		112		117		117		112		103		127		152		126		122		122	
Percent of All Possible:		47%		51%		53%		53%		51%		47%		58%		69%		57%		55%		55%	

Cost Benefit Analysis

The results from the MODA were then used to complete a high-level cost benefit analysis before official cost estimates were performed on the projects. The cost of each project was estimated using professional judgment based on similar facilities (see Table C-2).

The costs of the project were ranked from low cost to high cost and organized on a scale from 10 to 1, with 10 being the lowest cost and 1 being the highest cost, as shown in Table C-2. The cost points were then multiplied by the benefit points determined in the MODA to calculate the cost benefit of each project. This cost benefit metric is referred to as the value of the project.

Table C-2. Cost Benefit Analysis

Project	Cost		Points	Cost Benefit
Vintage Hills Swale Retrofit	Low	10	117	1170
SE 284th St and 109th Ave SE Road Retrofit	Low Med	6	152	912
SE 284th St West Road Retrofit	Low Med	6	126	756
SE 284th St Bioswale East Road Retrofit	Low Med	6	122	732
SE 287th St Road Retrofit	Low Med	6	117	702
124th Ave SE near SE 293rd St Road Retrofit	Med High	4	127	508
SE 284th St Road Retrofit	Med High	4	122	488
124th Ave SE near SE 307th Pl Road Retrofit	Med High	4	112	448
124th Ave SE near SE 302nd Pl Road Retrofit	Med High	4	103	412
Ridge at Willow Park TR B Pond Retrofit	High	1	112	112
Ridge at Willow Park TR C Pond Retrofit	High	1	103	103

The results of the cost benefit analysis showed that Vintage Hills, SE 284th Street Bioswale 1, and SE 284th Street Bioswale 2 have the highest cost benefit.

Road Treatment Analysis

The mileage of roadway treatment to be gained by each potential project was then measured and added to Table C-3.

Table C-3. Road Treatment

Project	Mileage of Road Treatment
SE 284th St and 109th Ave SE Road Retrofit	0.50
Ridge at Willow Park TR B Pond Retrofit	0.50
124th Ave SE near SE 302nd Pl Road Retrofit	0.30
124th Ave SE near SE 307th Pl Road Retrofit	0.24
SE 284th St Road Retrofit	0.23
Vintage Hills Swale Retrofit	0.20
SE 284th St East Road Retrofit	0.20
Ridge at Willow Park TR C Pond Retrofit	0.16
124th Ave SE near SE 293rd St Road Retrofit	0.15
SE 284th St West Road Retrofit	0.14
SE 287th St Road Retrofit	0.13

Results

Based all three analyses, the City has decided to move forward with eight projects listed in Table C-4. Each project was assigned a Capital Improvement Project (CIP) Identifier. The three projects removed were Ridge at Willow Park TR C (scored lowest in MODA and Cost Benefit Analysis), Ridge at Willow Park TR B (scored low in MODA and second lowest in Cost Benefit Analysis), and SE 284th Road Retrofit (scored medium in MODA and Cost Benefit Analysis but ranked worse than 124th Avenue SE Near SE 302nd Pl and 124th Avenue SE near SE 307th Pl in Mileage of Road Treatment).

Table C-4. Projects Chosen for Implementation

Project:	Implementation Schedule
CIP 1 - SE 287th St Road Retrofit	Short Term
CIP 2 - SE 284th St and 109th Ave SE Road Retrofit	Short Term
CIP 3 - SE 284th St West Road Retrofit	Short Term
CIP 4 - SE 284th St East Road Retrofit	Long Term
CIP 5 - 124th Ave SE near SE 293rd St Road Retrofit	Long Term
CIP 6 - Vintage Hills Swale Retrofit	Long Term
CIP 7 - 124th Ave SE near SE 302nd Pl Road Retrofit	Long Term
CIP 8 – 124th Ave SE near SE 307th Pl Road Retrofit	Long Term

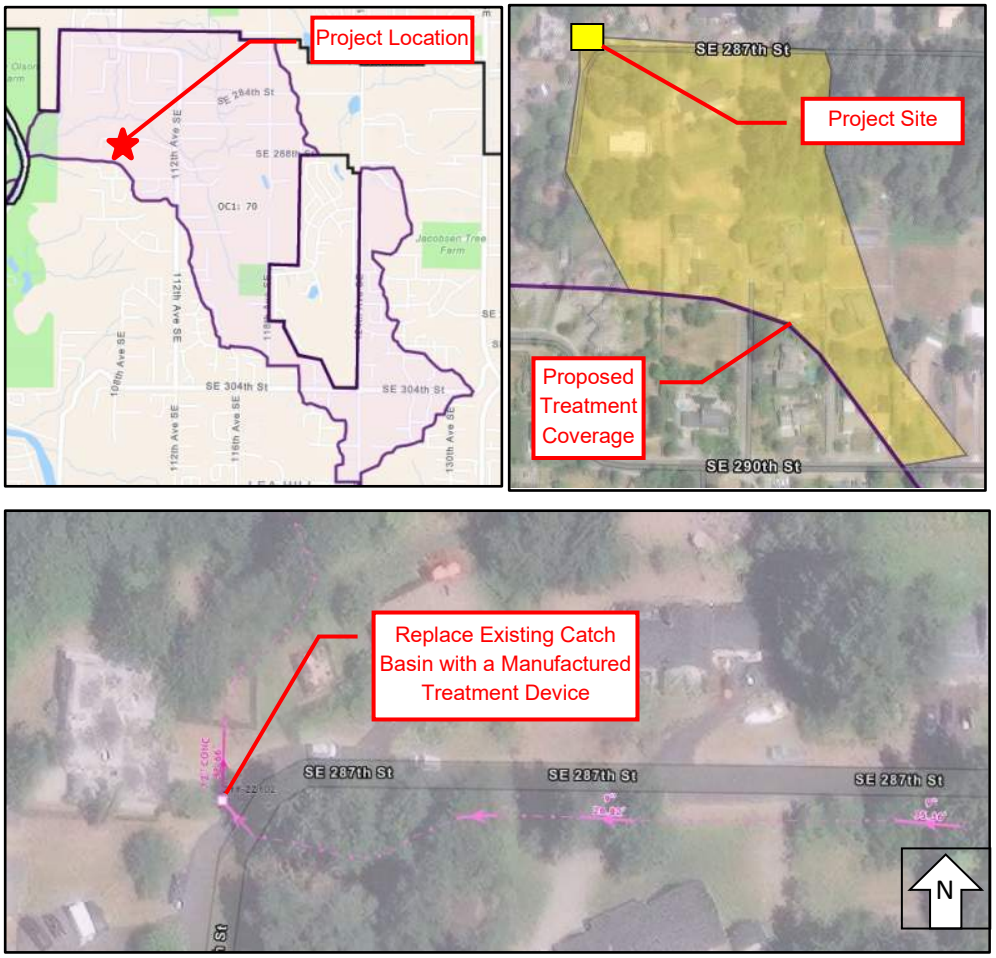
Detailed information for each of the proposed projects is in Appendix D.

Appendix D

Capital Improvement Project Summaries

Parametrix

Retrofit Site: **CIP 1 - SE 287th St**
Road Retrofit



RETROFIT TYPE
Road Retrofit, Manufactured Treatment Device
LOCATION
At the end of SE 287th St
EXISTING USE
ROW
PROPOSED USE
ROW with Enhanced Runoff Treatment
CREEK BASIN AND WATERSHED
Olson Creek
TRIBUTARY DRAINAGE AREA
7.32 Acres Total
1.99 Acres Impervious
COST OPINION (2023 DOLLARS)
$382,000

Project Description

The CIP 1 - SE 287th St project is proposing to replace the existing Type 1 catch basin with an Ecology TAPE approved manufactured treatment device to provide 7.31 acres with enhanced water quality treatment. This project would provide treatment for approximately 700 LF of roadway. The catch basin replacement will likely be low complexity since there is existing infrastructure in place and traffic control needs will be low. Final size, placement, and configuration of the project components may be adjusted as the design progresses.

Site Benefits

- Low traffic control requirements

Site Constraints/Difficulties

- WQ only, no flow control
- Need site survey to confirm catch basin is within located within City ROW

Opinion (Estimate) of Probable Cost

Project No.	Date
553-1931-048	March 2023

Project Name	CIP 1 - SE 287th Road Retrofit
Location	Near 10624 SE 287th St, Auburn, WA 98092
Owner	City of Auburn

Estimated By:	NR	**Checked By:**	SR	**Approved By:**	PF
Date:	3/6/2023	**Date:**	3/8/2023	**Date:**	3/20/2023

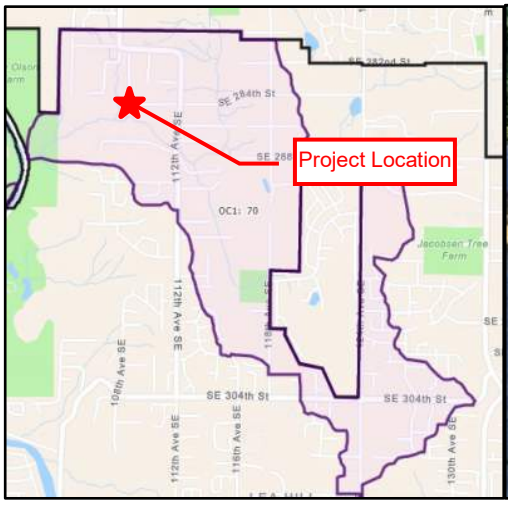
ITEM NO.	SPEC SECTION	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL COST
		SITE PREP AND TESC				
1		MOBILIZATION (10%)	10%	% of lines 5-13		$14,441.55
2		CONTRACTOR PROVIDED SURVEY (3%)	3%	% of lines 5-13		$4,332.47
3		TESC (5%)	5%	% of lines 5-13		$7,220.78
4		DEWATERING (2%)	2%	% of lines 5-13		$2,888.31
					Subtotal	**$28,883.11**
		MATERIALS				
5		SAWCUTTING	56	LF	$30.63	$1,715.28
6		PAVEMENT REMOVAL/RESTORATION	11	SY	$220.00	$2,346.67
7		ENHANCED MEDIA FILTER SYSTEM 6X8	2	EA	$60,000.00	$120,000.00
8		CONNECTION TO DRAINAGE STRUCTURE	4	EA	$3,415.34	$13,661.36
9		STRUCTURE EXCAVATION CLASS A INCL. HAUL	44	CY	$41.04	$1,824.00
10		SHORING OR EXTRA EXCAVATION CLASS B	1	LS	$1,000.00	$1,000.00
11		STRUCTURE EX AND SHORING LABOR (50% OF EACH)	50	% of lines 9-10		$1,412.00
12		CRUSHED SURFACING BASE COURSE	3	TN	$53.58	$176.22
13		RECORD DRAWINGS	1	LS	$2,280.00	$2,280.00
					Subtotal	**$144,415.53**

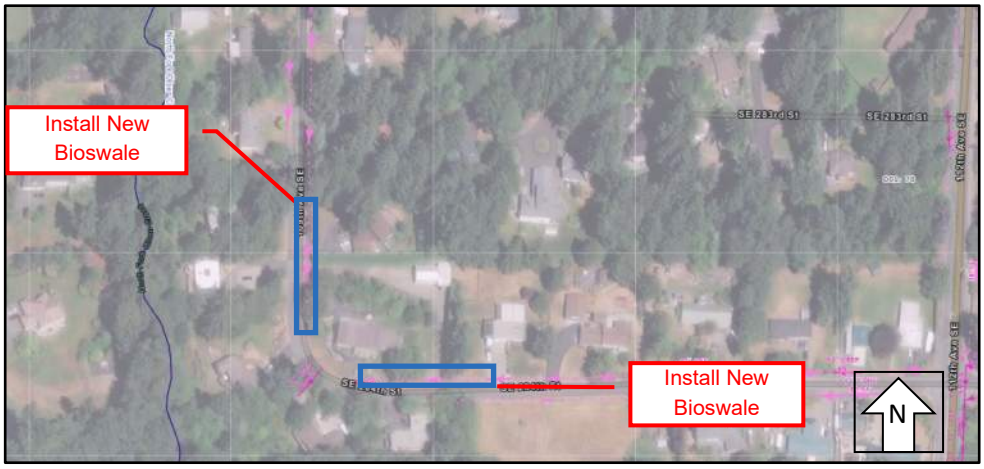
Subtotal Project Cost		**$173,298.63**
Design Contigency	**50%**	**$86,649.32**
Permitting	**5%**	**$8,664.93**
Design	**25%**	**$43,324.66**
City Project Mgmt. Admin.	**5%**	**$8,664.93**
Construction Management	**25%**	**$43,324.66**
Management Reserve	**10%**	**$17,329.86**
TOTAL PROJECT COST		**$382,000.00**

Parametrix

Retrofit Site: CIP 2 - SE 284th St and 109th Ave SE

Road Retrofit





RETROFIT TYPE	Road Retrofit, New Bioswale
LOCATION	SE 284th St and 109th Ave SE
CREEK BASIN AND WATERSHED	Olson Creek
EXISTING USE	ROW, vegetated and gravel driveway
PROPOSED USE	ROW with Basic Runoff Treatment
TRIBUTARY DRAINAGE AREA	20.6 Acres Total 3.0 Acres PGIS
COST OPINION (2023 DOLLARS)	$143,000

Project Description

The CIP 2 - SE 284th St and 109th Ave SE project will retrofit a section of SE 284th St by adding two bioswale ditch enhancements. The bioswales will provide basic water quality treatment to 20.6 acres including approximately 2300 LF of roadway. Final size, placement, and configuration of the project components may be adjusted as the design progresses.

Site Benefits

- Treatment can be situated within ROW
- Provides some flow control

Site Constraints/Difficulties

- Clearing and grubbing required

Opinion (Estimate) of Probable Cost

Project No.	Date
553-1931-048	March 2023

Project Name	CIP 2 - SE 284th St and 109th Ave SE Road Retrofit
Location	SE 284th St and 109th Ave SE
Owner	City of Auburn

Estimated By:	NR	**Checked By:**	SR	**Approved By:**	PF
Date:	3/6/2023	**Date:**	3/8/2023	**Date:**	3/20/2023

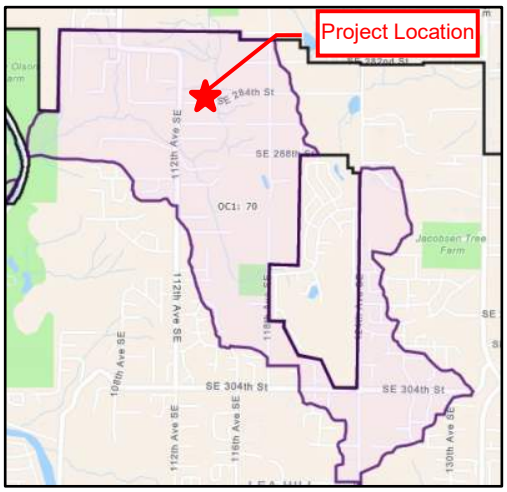
ITEM NO.	SPEC SECTION	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL COST
		SITE PREP AND TESC				
1		MOBILIZATION (10%)	10%	% of lines 5-9		$5,390.44
2		CONTRACTOR PROVIDED SURVEY (3%)	3%	% of lines 5-9		$1,617.13
3		TESC (5%)	5%	% of lines 5-9		$2,695.22
4		DEWATERING (2%)	2%	% of lines 5-9		$1,078.09
					Subtotal	**$10,780.88**
		MATERIALS				
5		CLEARING AND GRUBBING	0.1	ACRE	$ 10,000.00	$1,044.53
6		CHANNEL EXCAVATION INCL. HAUL	169	CY	$ 39.90	$6,723.89
7		TOPSOIL TYPE A	253	SY	$ 65.67	$16,599.07
8		COMPOST BLANKET	42	SY	$ 8.00	$337.04
9		SEEDING, FERTILIZING, AND MULCHING	505.6	SY	$ 57.76	$29,199.88
					Subtotal	**$53,904.41**

Subtotal Project Cost		**$64,685.29**
Design Contigency	**50%**	**$32,342.65**
Permitting	**5%**	**$3,234.26**
Design	**25%**	**$16,171.32**
City Project Mgmt. Admin.	**5%**	**$3,234.26**
Construction Management	**25%**	**$16,171.32**
Management Reserve	**10%**	**$6,468.53**
TOTAL PROJECT COST		**$143,000.00**

Parametrix

Retrofit Site: CIP 3 - SE 284th St West

Road Retrofit



RETROFIT TYPE	
Road Retrofit, New Bioswale	
LOCATION	
Along SE 284th St	
EXISTING USE	
Roadway	
PROPOSED USE	
ROW with Basic Runoff Treatment	
CREEK BASIN AND WATERSHED	
Olson Creek	
TRIBUTARY DRAINAGE AREA	
2.2 Acres Total	
1.1 Acres Impervious	
COST OPINION (2023 DOLLARS)	
$52,000	

Project Description

The CIP 3 - SE 284th St West project will retrofit a section of SE 284th St by adding two bioswale ditch enhancements to the side of the road. The bioswales will provide basic water quality treatment to 4.0 acres including approximately 700 LF of roadway. Final size, placement, and configuration of the project components may be adjusted as the design progresses.

Site Benefits

- Treatment can be situated within ROW
- Provides some flow control

Site Constraints/Difficulties

- Clearing and grubbing required

Opinion (Estimate) of Probable Cost

Project No.	Date
553-1931-048	March 2023

Project Name	CIP 3 - SE 284th St West Road Retrofit
Location	Near 11429 SE 284th St, Auburn, WA 98092
Owner	City of Auburn

Estimated By:	NR	**Checked By:**	SR	**Approved By:**	PF
Date:	3/6/2023	**Date:**	3/8/2023	**Date:**	3/20/2023

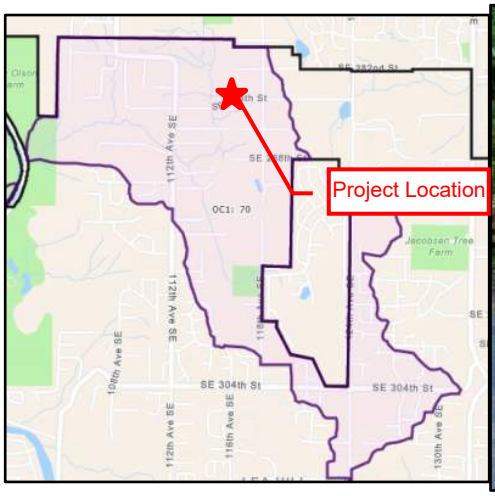
ITEM NO.	SPEC SECTION	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL COST
		SITE PREP AND TESC				
1		MOBILIZATION (10%)	10%	% of lines 6-10		$1,719.18
2		CONTRACTOR PROVIDED SURVEY (3%)	3%	% of lines 6-10		$515.76
3		TESC (5%)	5%	% of lines 6-10		$859.59
4		DEWATERING (2%)	2%	% of lines 6-10		$343.84
5		PROJECT TEMPORARY TRAFFIC CONTROL (15%)	15%	% of lines 6-10		$2,578.78
					Subtotal	**$6,017.14**
		MATERIALS				
6		CLEARING AND GRUBBING	0.04	ACRE	$ 10,000.00	$419.19
7		CHANNEL EXCAVATION INCL. HAUL	68	CY	$ 39.90	$2,698.42
8		TOPSOIL TYPE A	34	SY	$ 65.67	$2,220.51
9		COMPOST BLANKET	17	SY	$ 8.00	$135.26
10		SEEDING, FERTILIZING, AND MULCHING	202.89	SY	$ 57.76	$11,718.46
					Subtotal	**$17,191.83**

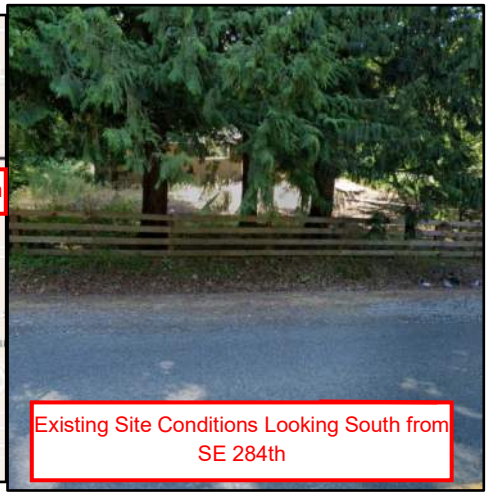
Subtotal Project Cost		**$23,208.98**
Design Contigency	**50%**	**$11,604.49**
Permitting	**5%**	**$1,160.45**
Design	**25%**	**$5,802.24**
City Project Mgmt. Admin.	**5%**	**$1,160.45**
Construction Management	**25%**	**$5,802.24**
Management Reserve	**10%**	**$2,320.90**
TOTAL PROJECT COST		**$52,000.00**

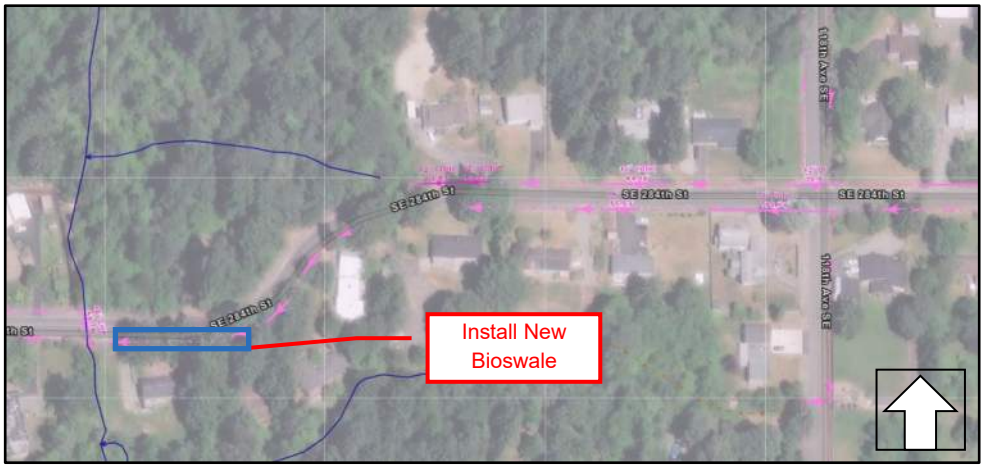
Parametrix

Retrofit Site: CIP 4 - SE 284th St East

Road Retrofit







RETROFIT TYPE
Road Retrofit, New Bioswale
LOCATION
Along SE 284th St
EXISTING USE
Roadside Ditch
CREEK BASIN AND WATERSHED
Olson Creek
TRIBUTARY DRAINAGE AREA
1.8 Acres Total
0.81 Acres Impervious
COST OPINION (2023 DOLLARS)
$28,000

Project Description

The CIP 4 - SE 284th St East project will retrofit a section of SE 284th St by adding a bioswale ditch enhancement to the side of the road. This bioswale will provide basic water quality treatment to 4.0 acres including approximately 1600 LF of roadway. Final size, placement, and configuration of the project components may be adjusted as the design progresses.

Site Benefits

- Treatment can be situated within ROW
- Provides some flow control

Site Constraints/Difficulties

- Clearing and grubbing required

Opinion (Estimate) of Probable Cost

Project No.	Date
553-1931-048	March 2023

Project Name	CIP 4 - SE 284th St East Road Retrofit
Location	Near 11619 SE 284th St, Auburn, WA 98092
Owner	City of Auburn

Estimated By:	NR	**Checked By:**	SR	**Approved By:**	PF
Date:	3/6/2023	**Date:**	3/8/2023	**Date:**	3/20/2023

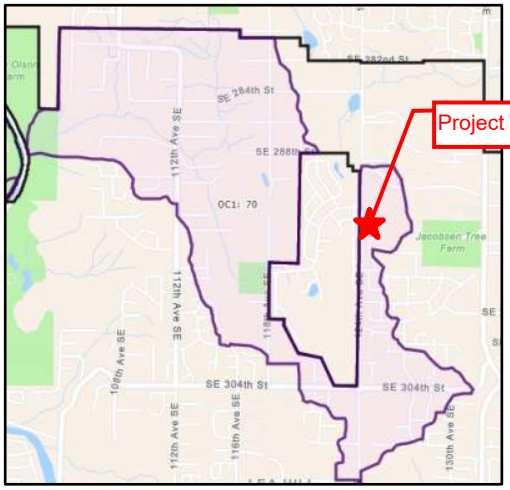
ITEM NO.	SPEC SECTION	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL COST
		SITE PREP AND TESC				
1		MOBILIZATION (10%)	10%	% of lines 6-10		$932.09
2		CONTRACTOR PROVIDED SURVEY (3%)	3%	% of lines 6-10		$279.63
3		TESC (5%)	5%	% of lines 6-10		$466.04
4		DEWATERING (2%)	2%	% of lines 6-10		$186.42
5		PROJECT TEMPORARY TRAFFIC CONTROL (15%)	15%	% of lines 6-10		$1,398.13
					Subtotal	**$3,262.31**
		MATERIALS				
6		CLEARING AND GRUBBING	0.0	ACRE	$ 10,000.00	$227.27
7		CHANNEL EXCAVATION INCL. HAUL	37	CY	$ 39.90	$1,463.00
8		TOPSOIL TYPE A	18	SY	$ 65.67	$1,203.89
9		COMPOST BLANKET	9	SY	$ 8.00	$73.33
10		SEEDING, FERTILIZING, AND MULCHING	110.0	SY	$ 57.76	$6,353.38
					Subtotal	**$9,320.87**

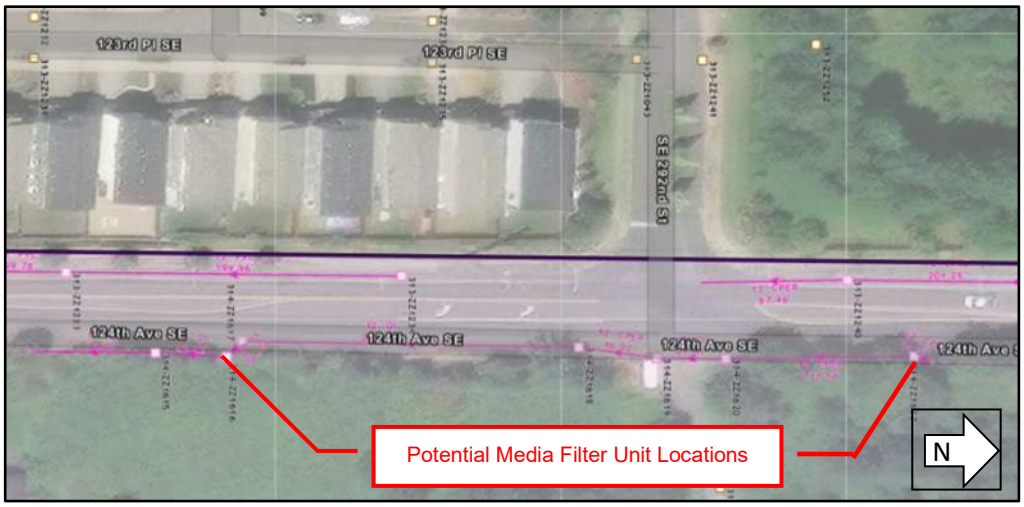
Subtotal Project Cost		**$12,583.18**
Design Contigency	**50%**	**$6,291.59**
Permitting	**5%**	**$629.16**
Design	**25%**	**$3,145.79**
City Project Mgmt. Admin.	**5%**	**$629.16**
Construction Management	**25%**	**$3,145.79**
Management Reserve	**10%**	**$1,258.32**
TOTAL PROJECT COST		**$28,000.00**

Parametrix

Retrofit Site: CIP 5 - 124th Ave SE near 293rd St

Road Retrofit





RETROFIT TYPE
Road Retrofit, Manufactured Treatment Device
LOCATION
124th Ave SE near 293rd St
CREEK BASIN AND WATERSHED
Olson Creek
EXISTING USE
Untreated ROW
PROPOSED USE
ROW with Enhanced Runoff Treatment
TRIBUTARY DRAINAGE AREA
14.14 Acres
2.41 Acres Impervious
COST OPINION (2023 DOLLARS)
$581,000

Project Description

The CIP 5 - 124th Ave SE project will retrofit a section of 124th Ave SE by replacing existing Type 1 catch basins with an Ecology TAPE approved manufactured treatment device. The manufactured treatment devices will provide enhanced water quality treatment to 14.14 acres including approximately 800 LF of roadway. Final size, placement, and configuration of the project components may be adjusted as the design progresses.

Site Benefits

- Provides enhanced stormwater treatment for a high ADT roadway

Site Constraints/Difficulties

- May be constrained by outlet height
- Coordination with utilities

Opinion (Estimate) of Probable Cost

Project No.	Date
553-1931-048	March 2023

Project Name	CIP 5 - SE 124th Ave SE near 293rd St Road Retrofit
Location	124th Ave near 293rd St
Owner	City of Auburn

Estimated By:	NR	**Checked By:**	SR	**Approved By:**	PF
Date:	3/6/2023	**Date:**	3/8/2023	**Date:**	3/20/2023

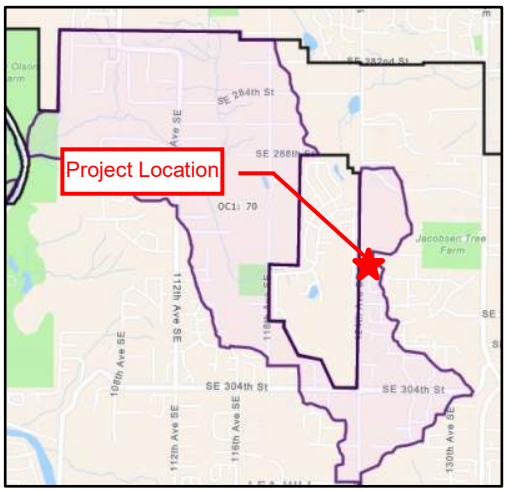
ITEM NO.	SPEC SECTION	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL COST
		SITE PREP AND TESC				
1		MOBILIZATION (10%)	10%	% of lines 6-16		$19,561.61
2		CONTRACTOR PROVIDED SURVEY (3%)	3%	% of lines 6-16		$5,868.48
3		TESC (5%)	5%	% of lines 6-16		$9,780.81
4		DEWATERING (2%)	2%	% of lines 6-16		$3,912.32
5		PROJECT TEMPORARY TRAFFIC CONTROL (15%)	15%	% of lines 6-16		$29,342.42
					Subtotal	**$68,465.64**
		MATERIALS				
6		UTILITY RELOCATION (SMALL)	1	LS	$15,000.00	$15,000.00
7		PAVEMENT REMOVAL/RESTORATION	52	SY	$220.00	$11,488.89
8		REMOVE CEMENT CONCRETE CURB AND GUTTER	20	LF	$13.68	$273.60
9		ENHANCED MEDIA FILTER SYSTEM 6X10	2	EA	$68,000.00	$136,000.00
10		CONNECTION TO DRAINAGE STRUCTURE	4	EA	$3,415.34	$13,661.36
11		STRUCTURE EXCAVATION CLASS A INCL. HAUL	52	CY	$41.04	$2,128.00
12		SHORING OR EXTRA EXCAVATION CLASS B	1	LS	$1,000.00	$1,000.00
13		STRUCTURE EX AND SHORING LABOR (50% OF EACH)	50	% of lines 9-10		$1,564.00
14		CRUSHED SURFACING BASE COURSE	4	TN	$53.58	$220.27
15		SCHEDULE A STORM SEWER PIPE 12 IN. DIAM.	100	LF	$120.00	$12,000.00
16		RECORD DRAWINGS	1	LS	$2,280.00	$2,280.00
					Subtotal	**$195,616.12**

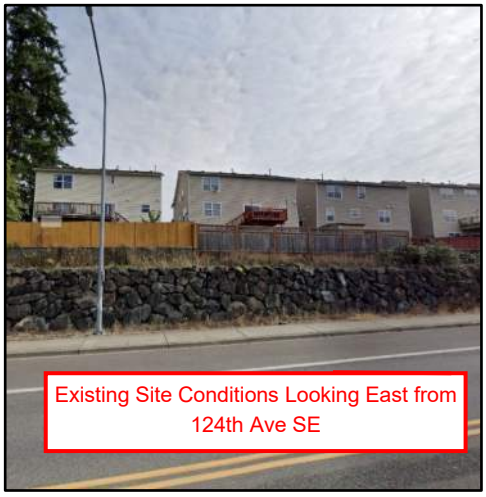
Subtotal Project Cost		**$264,081.77**
Design Contigency	**50%**	**$132,040.88**
Permitting	**5%**	**$13,204.09**
Design	**25%**	**$66,020.44**
City Project Mgmt. Admin.	**5%**	**$13,204.09**
Construction Management	**25%**	**$66,020.44**
Management Reserve	**10%**	**$26,408.18**
TOTAL PROJECT COST		**$581,000.00**

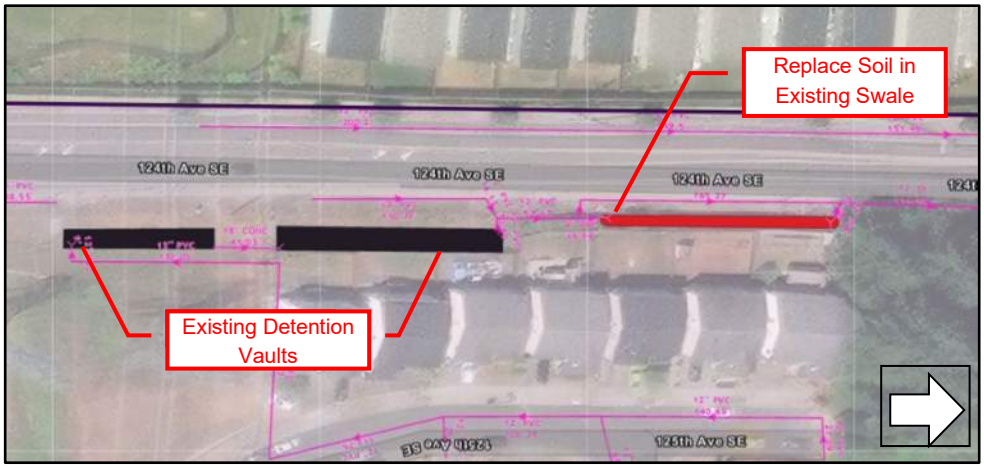
Parametrix

Retrofit Site: CIP 6 - Vintage Hills Swale Retrofit

Existing Facility Retrofit







RETROFIT TYPE	
Swale Retrofit, Soil Amendment	
LOCATION	
Along 124th Ave SE	
EXISTING USE	
Bioswale	
PROPOSED USE	
Bioretention Swale with Enhanced Treatment	
CREEK BASIN AND WATERSHED	
Olson Creek	
TRIBUTARY DRAINAGE AREA	
5.0 Acres Total 1.1 Acres PGIS	
COST OPINION (2023 DOLLARS)	
$264,000	

Project Description

The CIP 6 – Vintage Hills project is proposing amending the soil in the existing Vintage Hills swale. The soil will be replaced from conventional soil to bioretention soil to provide enhanced treatment for 5 acres. Rock check dams may be required throughout the length of the swale to ensure infiltration occurs to provide treatment. Final size, placement, and configuration of the project components may be adjusted as the design progresses.

Site Benefits

- Upgrading vintage basic treatment to enhanced treatment

Site Constraints/Difficulties

- WQ only, no flow control (though flow control is provided by the detention vaults)

Opinion (Estimate) of Probable Cost

Project No.	Date
553-1931-048	March 2023

Project Name	CIP 6 - Vintage Hills Swale Retrofit
Location	Near 29501 125th Ave SE, Auburn, WA 98092
Owner	City of Auburn

Estimated By:	NR	**Checked By:**	SR	**Approved By:**	PF
Date:	3/6/2023	**Date:**	3/8/2023	**Date:**	3/20/2023

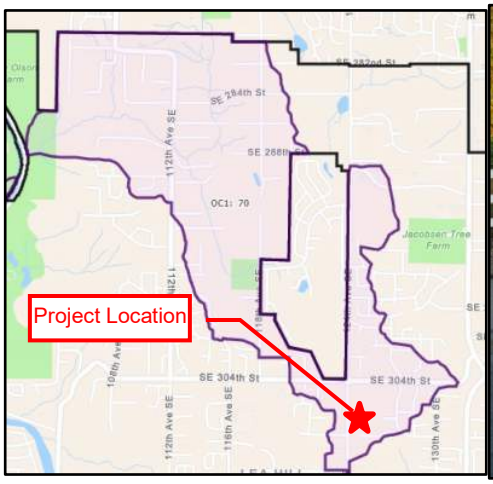
ITEM NO.	SPEC SECTION	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL COST
		SITE PREP AND TESC				
1		MOBILIZATION (10%)	10%	% of lines 6-13		$10,457.70
2		CONTRACTOR PROVIDED SURVEY (3%)	3%	% of lines 6-13		$3,137.31
3		TESC (5%)	5%	% of lines 6-13		$5,228.85
4		DEWATERING (2%)	2%	% of lines 6-13		$2,091.54
5		PROJECT TEMPORARY TRAFFIC CONTROL (15%)	15%	% of lines 6-13		$15,686.55
					Subtotal	**$20,915.40**
		MATERIALS				
6		CHANNEL EXCAVATION INCL. HAUL	151	CY	$39.90	$6,011.88
7		EROSION CONTROL BLANKET	75	SY	$9.12	$687.07
8		18" BIORETENTION SOIL	750	SF	$120.00	$90,000.00
9		COMPOST BLANKET	75	SY	$8.00	$602.69
10		QUARRY SPALLS	6	TN	$69.54	$424.07
11		TRASH RACK	1	EA	$500.00	$500.00
12		SEEDING, FERTILIZING, AND MULCHING	75	SY	$57.76	$4,351.30
13		RECORD DRAWINGS	1	LS	$2,000.00	$2,000.00
					Subtotal	**$104,577.01**

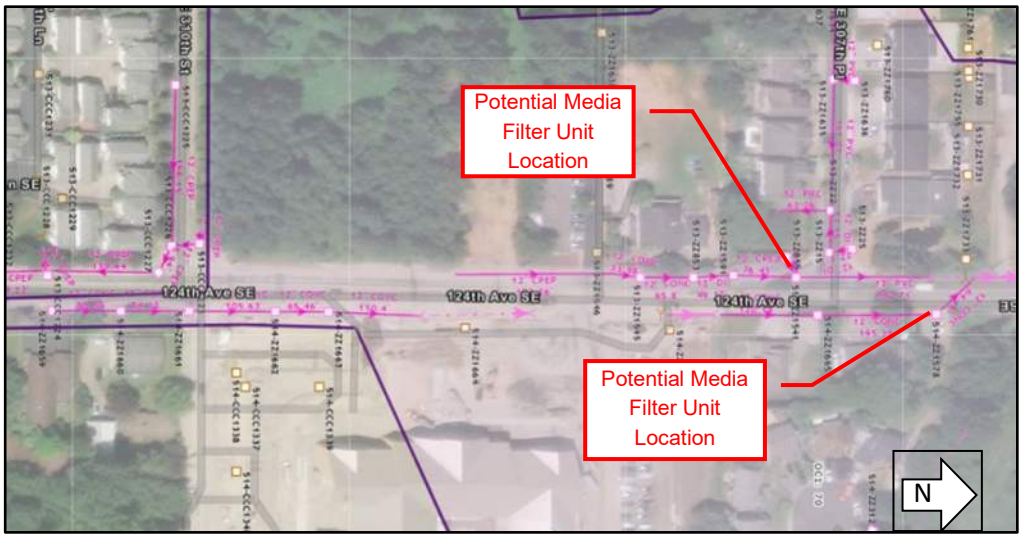
Subtotal Project Cost		**$125,492.41**
Design Contigency	**50%**	**$62,746.21**
Permitting	**5%**	**$6,274.62**
Design	**15%**	**$18,823.86**
City Project Mgmt. Admin.	**5%**	**$6,274.62**
Construction Management	**25%**	**$31,373.10**
Management Reserve	**10%**	**$12,549.24**
TOTAL PROJECT COST		**$264,000.00**

Parametrix

Retrofit Site: CIP 7 -124th Ave SE near 307th Pl

Road Retrofit





RETROFIT TYPE	
Road Retrofit, Manufactured Treatment Device	
LOCATION	
124th Ave SE near 307th Pl	
CREEK BASIN AND WATERSHED	
Olson Creek	
EXISTING USE	
Untreated ROW	
PROPOSED USE	
ROW with Enhanced Runoff Treatment	
TRIBUTARY DRAINAGE AREA	
5.9 Acres 1.4 Acres PGIS	
COST OPINION (2023 DOLLARS)	
$525,000	

Project Description

The CIP 7 - 124th Ave SE near 307th Pl project will retrofit a section of 124th Ave SE by replacing existing Type 1 catch basins with an Ecology TAPE approved manufactured treatment device. The manufactured treatment devices will provide enhanced water quality treatment to 5.9 acres including approximately 1200 LF of roadway. Final size, placement, and configuration of the project components may be adjusted as the design progresses.

Site Benefits

- Provides enhanced stormwater treatment for a high ADT roadway

Site Constraints/Difficulties

- May be constrained by outlet height
- Coordination with utilities
- Traffic control requirements

Opinion (Estimate) of Probable Cost

Project No.	Date
553-1931-048	March 2023

Project Name	CIP 7 - 124th Ave SE near 302nd Pl Road Retrofit
Location	124th Ave near 302nd Pl
Owner	City of Auburn

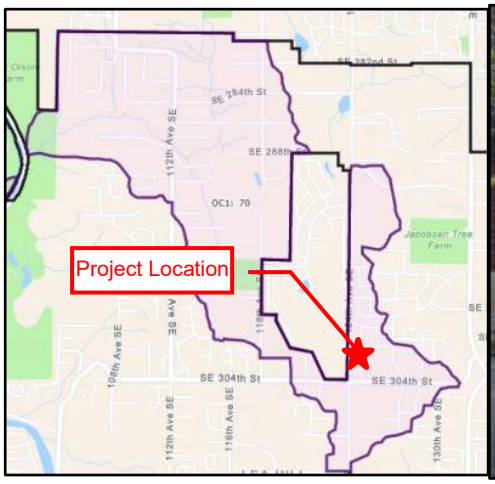
Estimated By:	NR	**Checked By:**	SR	**Approved By:**	PF
Date:	3/6/2023	**Date:**	3/8/2023	**Date:**	3/20/2023

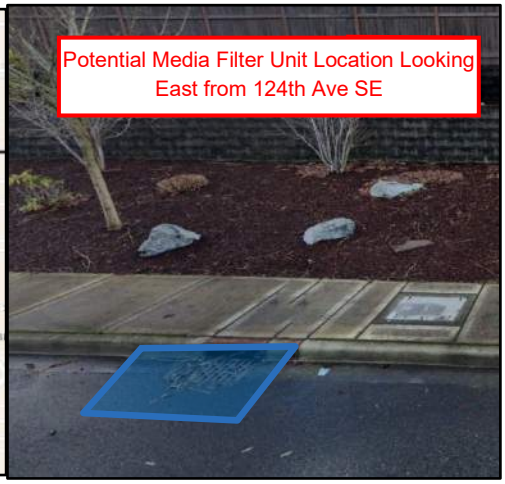
ITEM NO.	SPEC SECTION	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL COST
		SITE PREP AND TESC				
1		MOBILIZATION (10%)	10%	% of lines 6-16		$17,847.47
2		CONTRACTOR PROVIDED SURVEY (3%)	3%	% of lines 6-16		$5,354.24
3		TESC (5%)	5%	% of lines 6-16		$8,923.73
4		DEWATERING (2%)	2%	% of lines 6-16		$3,569.49
5		PROJECT TEMPORARY TRAFFIC CONTROL (15%)	15%	% of lines 6-16		$26,771.20
					Subtotal	**$62,466.14**
		MATERIALS				
6		UTILITY RELOCATION (SMALL)	1	LS	$15,000.00	$15,000.00
7		PAVEMENT REMOVAL/RESTORATION	50	SY	$220.00	$10,902.22
8		REMOVE CEMENT CONCRETE CURB AND GUTTER	16	LF	$13.68	$218.88
9		ENHANCED MEDIA FILTER SYSTEM 6X8	2	EA	$60,000.00	$120,000.00
10		CONNECTION TO DRAINAGE STRUCTURE	4	EA	$3,415.34	$13,661.36
11		STRUCTURE EXCAVATION CLASS A INCL. HAUL	44	CY	$41.04	$1,824.00
12		SHORING OR EXTRA EXCAVATION CLASS B	1	LS	$1,000.00	$1,000.00
13		STRUCTURE EX AND SHORING LABOR (50% OF EACH)	50	% of lines 9-10		$1,412.00
14		CRUSHED SURFACING BASE COURSE	3	TN	$53.58	$176.22
15		SCHEDULE A STORM SEWER PIPE 12 IN. DIAM.	100	LF	$120.00	$12,000.00
16		RECORD DRAWINGS	1	LS	$2,280.00	$2,280.00
				Subtotal		**$178,474.68**
				Subtotal Project Cost		**$240,940.82**
				Design Contigency	**50%**	**$120,470.41**
				Permitting	**5%**	**$12,047.04**
				Design	**25%**	**$60,235.20**
				City Project Mgmt. Admin.	**5%**	**$12,047.04**
				Construction Management	**25%**	**$60,235.20**
				Management Reserve	**10%**	**$24,094.08**
				TOTAL PROJECT COST		**$531,000.00**

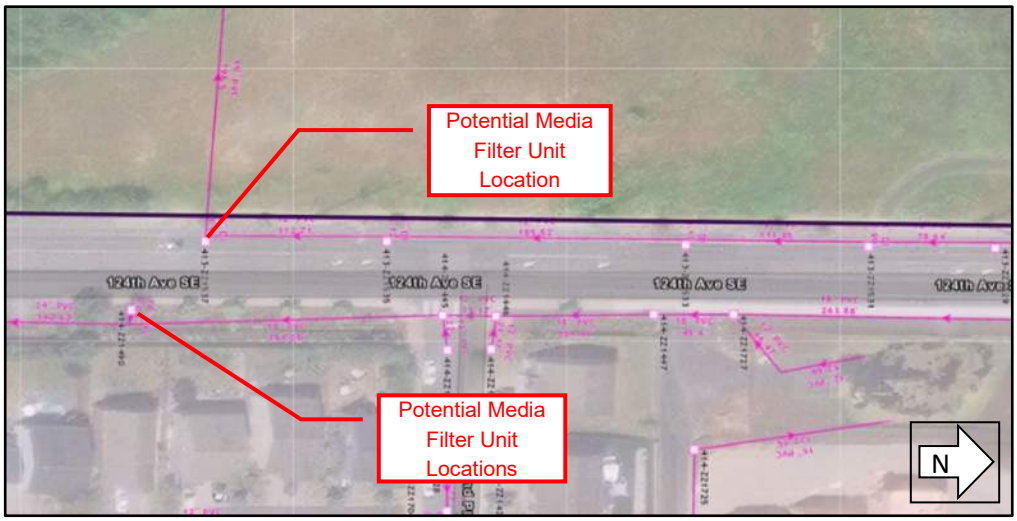
Parametrix

Retrofit Site: CIP 8 -124th Ave SE near 302nd Pl

Road Retrofit







RETROFIT TYPE
Road Retrofit, Manufactured Treatment Device
LOCATION
124th Ave SE near 302nd Pl
CREEK BASIN AND WATERSHED
Olson Creek
EXISTING USE
Untreated ROW
PROPOSED USE
ROW with Enhanced Runoff Treatment
TRIBUTARY DRAINAGE AREA
2.9 Acres Total 1.3 Acres PGIS
COST OPINION (2023 DOLLARS)
$531,000

Project Description

The CIP 6 - 124th Ave SE near 302nd Pl project will retrofit a section of 124th Ave SE by replacing existing Type 1 catch basins with an Ecology TAPE approved manufactured treatment device. The manufactured treatment devices will provide enhanced water quality treatment to 2.9 acres including approximately 1600 LF of roadway. Final size, placement, and configuration of the project components may be adjusted as the design progresses.

Site Benefits

- Provides enhanced stormwater treatment for a high ADT roadway

Site Constraints/Difficulties

- May be constrained by outlet height
- Coordination with utilities
- Traffic control requirements

Opinion (Estimate) of Probable Cost

Project No.	Date
553-1931-048	March 2023

Project Name	CIP 8 - 124th Ave near 307th Pl Road Retrofit
Location	124th Ave near 307th Pl
Owner	City of Auburn

Estimated By:	NR	**Checked By:**	SR	**Approved By:**	PF
Date:	3/6/2023	**Date:**	3/8/2023	**Date:**	3/20/2023

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Subtotal Project Cost		**$240,940.82**
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